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NATIONAL PARK SERVICE / AIR QUALITY DIVISION

NATIONAL PARK SERVICE
AIR RESOURCE MANAGEMENT MANUAL

U.S. Department of the Interior
National Park Service
Air Quality Division
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NB . 375

ACKNOWLEDGEMENTS

This manual is a product of the National Park Service, WASO Air Quality Division. The Park Service would like to thank Steve Connolly, Carol Hackes Duckett and Lori Hewitt of Schwartz, Connolly and Jellinek, Inc. for their efforts and help in writing this manual.

Drafts of the manual were reviewed by Superintendents, resource managers and regional office personnel. Their comments and insights helped make the manual a usable reference which will help Park Service personnel manage the air resource.

NATIONAL PARK SERVICE
AIR RESOURCE MANAGEMENT MANUAL

Executive Summary

PREFACE

This manual explains the nature and value of air as a park resource; describes the National Park Service (NPS) mission to manage the air resource in its units; describes the NPS organization for air resource management; identifies the causes and effects of air pollution and related resource management concerns; and provides information on assistance available in the NPS on air resource management issues.

The manual has several uses. It summarizes various NPS air resource-related authorities. It is a tool to assist NPS decision makers in determining a proper response to actual or potential air pollution effects on resources or visitors' experiences. It is a reference guide to assist park personnel in air resource management activities.

The manual has been developed for use by NPS personnel who have the responsibility to protect park resources from air pollution impacts.

The manual will be periodically revised and updated as issues evolve and relevant information changes.

INTRODUCTION TO AIR RESOURCE MANAGEMENT

Air as a Natural Resource

Air is a critical factor in determining the quality of a park's other resources. Polluted air can harm park resources in many ways, including leaching nutrients from the soil, acidification of water, structural or functional damage to vegetation, discoloration and accelerated weathering of building and monuments, and impairment of visibility. Air must be carefully managed to prevent these harmful effects.

Air Pollutants: Types, Sources, and Effects

Gaseous pollutants include sulfur dioxide (SO_2), nitrogen oxides (NO_x), ozone (O_3), carbon monoxide (CO), volatile organic compounds (VOC), hydrogen sulfide (H_2S), and hydrogen fluoride (HF). These pollutants are emitted from large stationary sources such as fossil fuel fired power plants, smelters, industrial boilers, and petroleum refineries, as well as from internal combustion engines. They are corrosive to materials, cause injury to plants, aggravate respiratory diseases, and reduce visibility.

Particulate matter includes large particles such as dust, asbestos fibers, and lead, as well as very small or "fine" particles such as sulfates (SO_4) and nitrates (NO_3). Major sources of particulates include power plants, smelters, industrial operations, forest fires, and automobiles. Asbestos and lead impact human health, while sulfates and nitrates not only cause health problems, but also contribute to acid rain and reduction in visibility.

An Approach to Understanding Air Pollution Problems

Several basic questions provide a useful method to approach air pollution problems. These include questions on current or projected air pollutant levels, the source(s) of the pollutants, effects on park resources, and the control or mitigation of the pollutant emissions and effects.

NPS AIR RESOURCE MANAGEMENT

Mission Statement

The NPS mission regarding air resource management has two objectives: (1) to protect park resources; and (2) to assure visitor enjoyment of parks and their resources. Both objectives are based on authorities contained in the NPS Organic Act, the Clean Air Act (CAA), and other statutes.

NPS Organizational Units Responsible for Air Resource Management

Parks are closest to potential air pollution problems; their staffs conduct monitoring and effects research, and provide "early warning" information. Each region coordinates air related activities involving NPS units in that region, and acts as liaison between the parks and Washington Office (WASO). The WASO Air Quality Division (AQD) has the primary responsibility for the NPS air resource management program. Technical support to parks is available from the AQD's staff located in Denver.

Department of the Interior Role in NPS Air Resource Management: In the Department of the Interior the ultimate decision authority on CAA matters has been delegated by the Secretary to the Assistant Secretary for Fish and Wildlife and Parks.

KEY NPS AIR RESOURCE MANAGEMENT ACTIVITIES

Planning

Participation in planning activities, both internal (Statements for Management, General Management Plans (GMPs), and Resources Management Plans (RMPs)) and external (other governmental resource management planning - land use, mineral leasing, rights-of-way) provides an opportunity for incorporating air resource management goals, objectives, issues, and projects.

Research and Monitoring

Research activities include natural resource effects, visibility and visual values studies, and predictive air quality modeling. Monitoring activities include visibility, air quality, and effects monitoring. They are designed to assess park air quality and resource sensitivity; to assess the impact of air pollution on park resources and visitor experience; and to determine causes of adverse resource effects and identify mitigating measures.

Development and Analysis of Regulations

NPS concerns about possible adverse impacts of regulated activities such as highway development, disposal sites, or new facilities should be made known to agencies through testimony at hearings or responding to proposals at the appropriate level. Without NPS participation such regulatory decisions could lead to potential air quality degradation at NPS units.

Environmental Assessment and Environmental Impact Statement Development and Review

The NPS must assure that other agencies' activities which may impact park resources are environmentally acceptable, as well as that its own projects are environmentally sound.

Mineral Resource Leasing

Park staff determine baseline conditions of resources and identify scenic viewpoints which may be impacted by such leasing. Park staff and the WASO Energy, Mining and Minerals Division (EMMD) should participate in the Environmental Impact Statement (EIS) process for mineral leasing, especially at the early scoping meeting stage, and assure that adequate preventive or mitigating measures are addressed.

Interpretive Activities

Interpretive programs inform visitors about the air resource management program in parks - the value of the air resource, the ways that air pollution affects park resources, the research and monitoring programs being conducted in the parks, and the statutory authorities which define the NPS role in air quality preservation.

Clean Air Act Activities

Certain NPS management activities that may generate air pollution include prescribed fire or construction and operation of a boiler plant, for example. These activities may be subject to state, local and/or Environmental Protection Agency (EPA) regulations. Also, the CAA provides a strong air quality protection program for many national parks and NPS wilderness areas.

Under the CAA, the EPA establishes national ambient air quality standards to protect public health and welfare, national emission standards for new factories and industrial processes (new source performance standards), national emission standards for hazardous air pollutants (such as beryllium and asbestos), and national motor vehicle emission control standards. States (and where delegated, local governments) have the primary responsibility for implementing and enforcing the federally established air pollution requirements. The CAA requires that each state adopt a State Implementation Plan (SIP) which assures attainment and maintenance of federal air pollution control requirements. Separate SIP requirements are established for areas depending on their air quality status, either "nonattainment areas" or "clean air areas". Nonattainment areas" are areas in which the air quality for one or more pollutants is worse than the applicable national ambient air quality standards. The SIP contains measures that will assure attainment of those standards in those areas by the deadlines established in the CAA. "Clean air areas" ("attainment areas") are areas which have air quality better than the applicable national ambient standards. The SIP contains measures which assure no new violations of the national standards. The requirements for such "clean air areas" are entitled Prevention of Significant Deterioration (PSD) requirements, and are most important for NPS air quality management responsibilities. Subsequent subsections will provide more detail on parts of the PSD requirements from the NPS perspective.

The CAA also specifies that all federal, state and local government facilities, properties and activities are subject to federal, state and local air pollution requirements.

The State Implementation Plan

Portions of the SIP contain provisions to protect NPS lands and resources from air pollution damage. The NPS should participate in the SIP development and review process to assure resource protection. The lead responsibility for providing technical assistance in influencing States to incorporate adequate park protection measures in the SIPs lies with the AQD, with assistance from regional and park level staff in maintaining an effective dialogue with the State and local air pollution officials.

The New Source Permitting Process - Prevention of Significant Deterioration (PSD)

The new source review process is a preconstruction review and licensing program for major new or expanding sources of air pollution. The PSD rules establish a classification system for the clean air areas of the country for two pollutants, sulfur dioxide and total suspended particulates. The class indicates the amount or "increment" of additional air quality degradation to be allowed in an area - class I, only a very small increment; class II, a moderate amount; and class III, a substantial increase, but in any case, ambient air pollutants cannot exceed the National Ambient Air Quality Standards (NAAQS) for the two pollutants. Congress designated 158 national parks, wilderness areas and wildlife refuges as class I areas; 48 of these class I areas are NPS units. The classification system is important in the understanding of the NPS responsibilities within the PSD new source permit review process. Any facility seeking a new source permit to locate or expand in a clean air area must meet several tests: no violation of NAAQS, no violation of increments, and resolution of an "adverse impact determination" in the case of class I areas. The adverse impact determination is site-specific. The Federal Land Manager (FLM) for a class I area examines whether a proposed facility will adversely affect the resources (Air Quality Related Values-AQRVs) of that area. If the FLM determines that the resources will not be adversely affected, then the permitting authority (EPA or state) may authorize the facility even if the class I increment would be violated (the facility must then meet a revised set of class I increments). If the FLM can demonstrate that the facility would have an adverse impact on park resources (even if the class I increment were not violated), the permitting authority may not authorize the facility.

After being informed of a proposal to locate or expand a facility near an NPS class I area, the AQD consults with the superintendent of the unit affected and the appropriate regional office, then begins its analysis of the potential air pollution impacts. The analysis includes review and verification of air quality data, pollution control technology, and the predicted concentration of pollutants in the class I area; identification of sensitive, dominant, bioindicator, and rare and endangered species of plants and animals; review of literature for known effects on natural and cultural resources; determination of existing injury to such resources; and determination of visibility degradation.

Upon completion of the effects analysis, the AQD coordinates final NPS comments on the proposed source's permit application. The Director forwards NPS recommendation to the Assistant Secretary for Fish and Wildlife and Parks who makes the final determination of adverse impact.

Air Quality Modeling

An air quality model is a mathematical representation of the physical and chemical processes by which air pollutants are emitted into, dispersed, transformed and deposited out of the atmosphere. It attempts to predict the effect that a source or sources of pollution will have on air quality levels at particular points on the ground called "receptors". Modeling may be done simply with pencil, paper, and a pocket calculator, or it more likely will require complex computer assisted calculations. The models used as part of the new source permit review process are in general those which have been approved by EPA. The reasonableness of a model, its assumptions, its output, and its interpretation are always verified by the AQD in permit applications for sources which may affect NPS areas.

Remedying Existing Pollution Impacts

If air pollution damage is suspected at a park, the AQD should be notified immediately. AQD staff will determine if the suspected damage is air pollution related, and if so, then attempt to quantify and document the problem. The documentation will include air pollution damage to resources, the source or sources responsible, and alternative actions to be taken to reduce or eliminate such damage. These actions may include determination of source compliance with air pollution control regulations, consultation with the source, or initiation of litigation.

Another set of tools can be used when a park's visual air resource is being impaired by emissions from existing sources. These are CAA requirements for protection of specially designated class I visibility areas. They require EPA and the states to identify visibility impairing sources and the class I areas they affect, and require any major stationary source to install Best Available Retrofit Technology (BART) to reduce or eliminate visibility impairing pollutants.

The Redesignation Process

The CAA provides states (or Indian tribes) authority to redesignate clean air areas to provide greater or lesser protection from air pollution degradation. FLMs were required by Congress to review all national monuments, primitive areas, and preserves and recommend appropriate areas for redesignation to class I. The Department of the Interior conducted such a review in 1979 and made its recommendations in the Federal Register on June 2, 1980. If a state proposes to redesignate an area, the state must conduct health, environmental, economic, social and energy studies and hold public hearings on the effects of a proposed redesignation prior to making such redesignation. The NPS may involve itself in the redesignation process by working with states contemplating redesignation and assisting in preparation of relevant sections of the required analyses, assuring that adequate consulation takes place regarding effects on park air quality and resources, and reviewing such redesignation proposals. Only the states and Congress have the authority to redesignate an area.

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PREFACE

This manual has been developed for use by National Park Service (NPS) Superintendents and resource managers, regional air quality coordinators and other personnel involved in managing and protecting area resources from actual or potential damage from air pollution. It has been designed to accomplish several purposes. One purpose is to provide an explanation of the nature and value of the air resource and its relevance to the parks and to the park visitor's experience. Another purpose is to describe the mission of the National Park Service to manage the air resource in its units. The manual is also designed to provide an explanation of the way in which NPS is organized for its air resource managementrelated tasks and to introduce the types of major air pollution/ resource protection issues that are likely to arise requiring some response or action by NPS personnel. A final purpose of the manual is to provide some specific information on the kinds of assistance available within NPS, particularly from within the Air Quality Division, to aid Service personnel in air resource management.

The manual has been developed for use by NPS personnel in a number of ways. It can be referred to as a source of summary information on the various air resource-related management authorities of the NPS. It also can serve as a tool to assist NPS decisionmakers in determining the course(s) of action available when actual or potential air pollution influences other park resources and/or the visitor's experience. Furthermore, it can be used as a reference guide to the types of programs and services available to assist park personnel in their air resource management-related activities. The manual has been designed so that, as issues and knowledge evolve and relevant information changes, it can be periodically revised and updated accordingly.

INTRODUCTION TO AIR RESOURCE MANAGEMENT

AIR AS A NATURAL RESOURCE

NPS units are comprised of a variety of natural, recreational, historical and cultural resources. In any given park, important national resources include wildlife, vegetation, surface and groundwater, minerals and soils, and special geological features such as canyons, caves or other rock formations. Other resources important to an NPS unit might include man-made structures or artifacts of special historical or cultural significance. All these resources are managed by the NPS, as mandated by law, in order to protect and preserve these areas for present and future visitors' enjoyment.

The vitality of any one of these resources is a function of the interplay of a number of factors including the quality of the other resources in the area. This is particularly true in the case of air quality. The air is an important component of the natural system in its own right. However, it also is a potentially critical factor in determining the quality of a park's other environmental resources and the integrity of natural formations as well as man-made structures in the area. Without careful management of the air resource, the resultant exposure of NPS lands to poor air quality may lead to a variety of potentially serious consequences. Depending on a number of factors, including the chemistry of the particular air pollutant(s) involved, the nature of existing meteorological and other environmental conditions, and the specific natural or cultural features in any given park, polluted air can harm important park resources in a wide range of ways. Harmful effects might initially include leaching of important nutrients from the soil, acidification and other forms of water quality degradation, and damage to the structure and/or the function of various types of vegetation (See Figure 1). These, in turn, may result in long-term and serious resource damage such as the destruction of important habitats or food sources for certain species of wildlife and significant reductions in wildlife populations or plant communities because of harmful air quality during important growth or reproductive periods. Beyond damage to natural resources, air quality degradation may also take its toll on other types of park resources; for example, it has been shown that certain air contaminants may cause serious discoloration and/or weathering damage to historical buildings and monuments and natural rock formations.

NPS units contain another key resource which may be seriously damaged by air pollution. That resource is visibility. The importance of scenic vistas and visual air quality to many NPS units and to the visitor's experience of those areas cannot be overemphasized. In fact, the enabling legislation for many park units expressly recognizes certain dramatic, spectacular vistas in those areas as being unique features of the area which deserve to be specially protected and

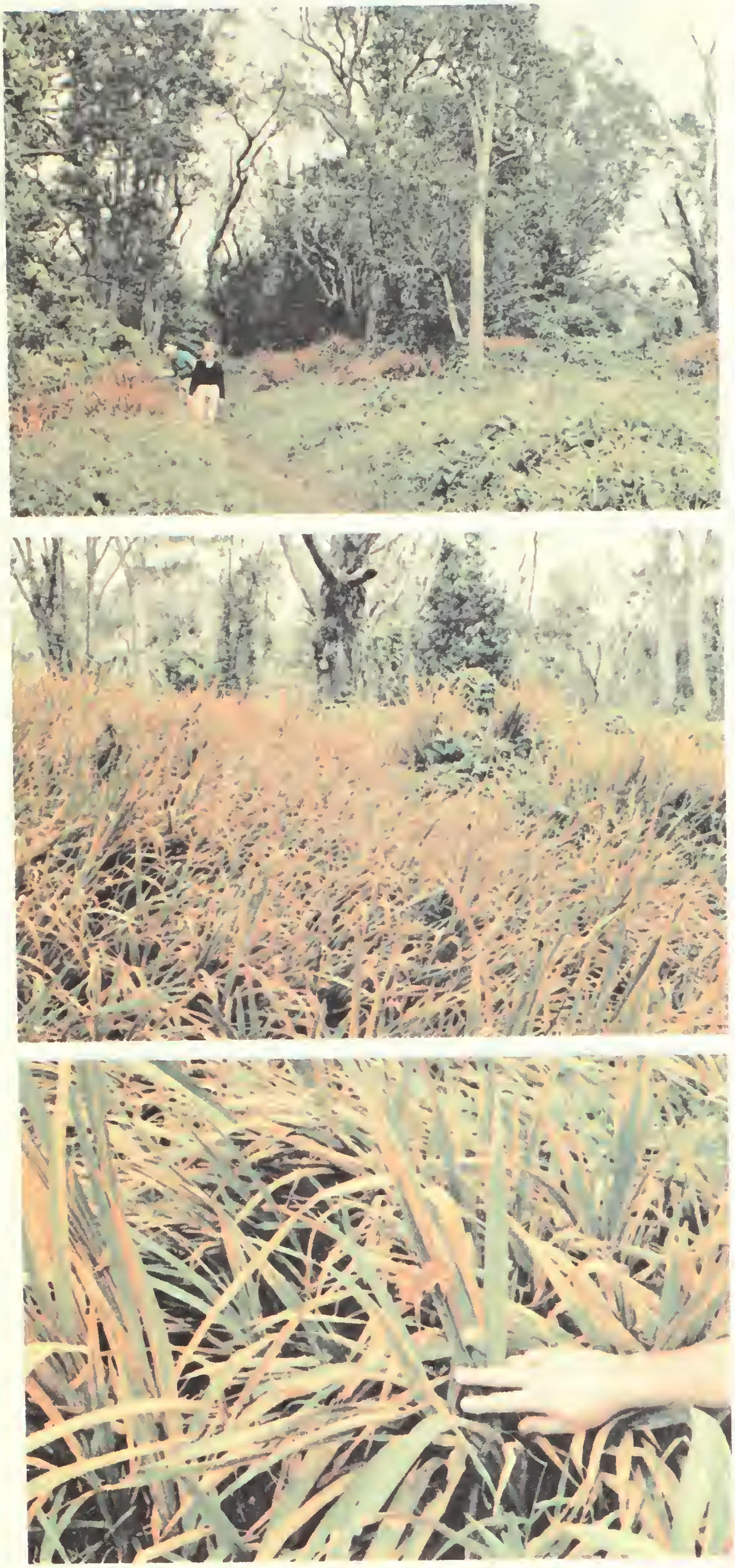

Figure 1.

Sulfur dioxide damage to vegetation at Hawaii Volcanoes National Park. The species showing the injury is not native to the park. The source of the sulfur dioxide was the Kilauea Volcano (NPS photographs).

preserved for the enjoyment of not only today's visitors, but also generations of visitors yet to come. Thus, the NPS is charged with the responsibility of assuring not only that the park vegetation and trees are preserved, that the water is clean and the health of the wildlife and vegetation is maintained in its units, but also that the magnificence of all park resources can be seen and experienced to the fullest by the visitor. Good visual air quality, therefore, is another important park resource which may be seriously affected by air pollution and which demands careful management protection (See Figure 2).

The harmful effects of air pollution on the park visitor's visual and recreational experience are particularly relevant, given the dramatic increase in recent years in visitor use of the national parks. Most visitors, many of whom are making repeat visits to these areas, arrive with expectations about what their experience in a park will involve. They may be seriously disappointed and dissatisfied if, because of dirty air and degraded visibility, they are no longer able to experience these areas in ways previously possible.

In summary, good air quality is a resource among many resources within a parkland which help to constitute the very basis for the establishment and the value of the national parks. This means that wise and effective management of a park's air quality is imperative. It has become increasingly evident in recent years that clean, high quality air cannot be taken for granted. It is neither infinite nor impervious to degradation from manmade or natural resources. Its capacity for renewal is considerable, but not unlimited. Furthermore, as is the case with certain other resources, mitigation efforts may provide for only limited renewal of the resource once it is degraded. The most cost-effective management approach, therefore, is one aimed at prevention of harm to the air resource and to the variety of other related natural and cultural resources.

The need for careful management of the air resource in NPS units has been recognized for many years, and has been demonstrated in the enactment of various individual laws establishing NPS units as well as in NPS management practices designed to protect these areas. Furthermore, the concept was specifically recognized by the Congress in 1977, when it amended the Clean Air Act to provide added protection to certain clean air areas such as NPS units. These amendments gave the NPS an additional tool for protecting park resources from air pollution damage. Under the Act as amended, the managers of certain federal lands are given an affirmative responsibility to protect "air quality related values (including visibility)"* in areas under their jurisdic-

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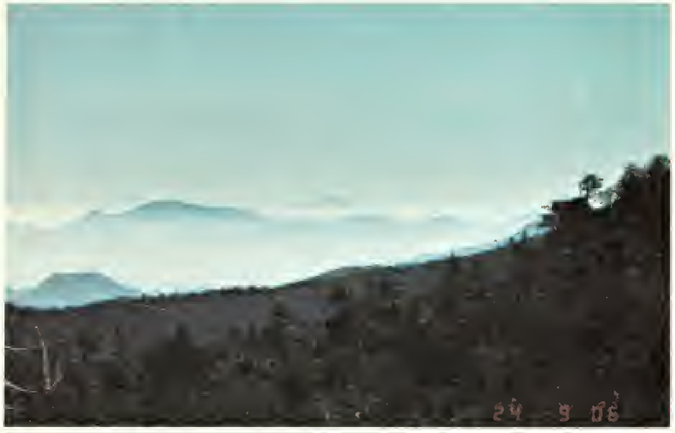
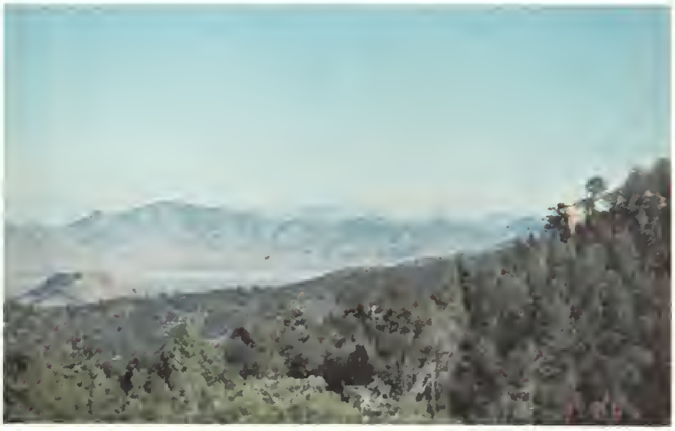
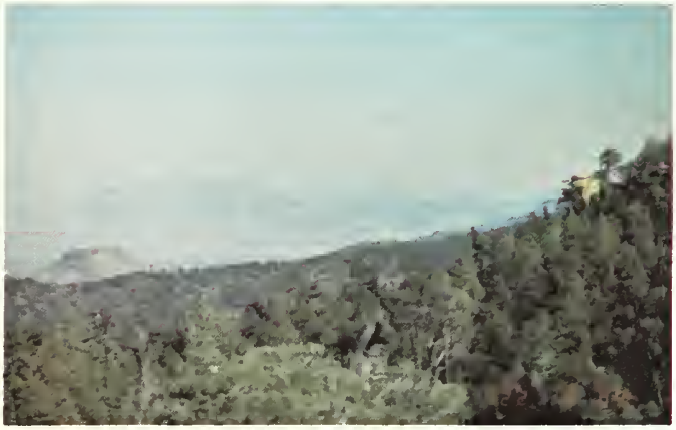
* Air quality related values are values in an area which are dependent upon and affected by air quality. The National Park Service definition follows: "Air Quality Related Values are all those values possessed by an area except those that are not affected by changes in air quality values include visibility and those scenic, cultural, biological, and recreation resources of an area that are affected by air quality." (43 Fed. Reg. 15016.)



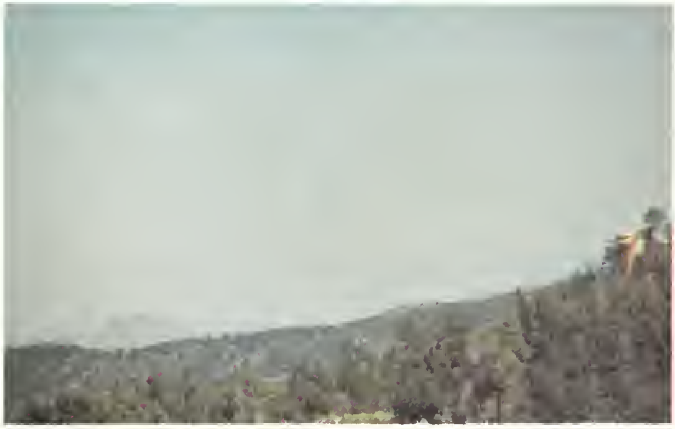
Layered haze as seen from Chiricahua National Monument.



Visual range of 380 km (236 miles)



Visual range of 150 km (93 miles)



Visual range of 20 km (12 miles)

Figure 2. The effect of regional haze and layered haze on a vista at Chiricahua National Monument (NPS photographs).

tion. Subsequent sections of this manual will discuss the types of air quality related values (AQRVs) important to NPS units and will provide information on opportunities and tools (e.g., legislative authority, in-house expertise and technical assistance) available to Service personnel for acting to preserve and enhance air quality in NPS lands (see NPS AIR RESOURCE MANAGEMENT and KEY NPS RESOURCE MANAGEMENT ACTIVITIES, pgs. 32 and 39).

AIR POLLUTANTS: TYPES, SOURCES, AND EFFECTS

In any given park unit, there may be a variety of air pollutants which could cause detrimental effects on the important resources in that unit. These emissions could come from various types of sources located immediately adjacent to (sometimes within) the unit, or they may be generated by sources significant distances away. Most park resource managers will be faced with air pollution problems from certain key types of sources and major pollutants. To help park personnel in their efforts to anticipate, understand, and respond to these problems, some general information on major air pollutant types, sources and effects is presented below. This information is summarized in chart form at the end of this subsection.

Gaseous Pollutants

Sulfur dioxide (SO_2). This is the most significant of the acrid and poisonous sulfur oxide gases which are produced when fuel containing sulfur is burned. (Sulfur dioxide is a colorless and odorless gas at ambient levels.) Power plants and industrial boilers are the principal producers since the coal and oil which they burn contain sulfur as an impurity (See Figure 3). Other types of sources are smelters and refiners of sulfurbearing ores such as copper. The only significant natural sources of sulfur dioxide are biological decay and volcanic activity. The amount of sulfur dioxide generated as a result of man's activities greatly exceeds the amount from natural sources.

Sulfur dioxide, as well as the compounds to which it is converted in the atmosphere (see sulfate, below), is extremely corrosive to a variety of materials, including metals, building materials, paints, and electrical equipment. It can penetrate the respiratory system to the lungs and damage tissue; there is considerable evidence that sulfur pollution aggravates existing respiratory diseases and contributes to the development of these conditions. Sulfur dioxide has been found to cause serious injury and growth loss to Douglas fir, ponderosa pine, white pine, forest shrubs, and various crops including alfalfa, grains, squash, cotton, grapes and apples. The conversion of sulfur dioxide in the environment to sulfate ($SO_4^=$) and sulfuric acid (H_2SO_4) leads

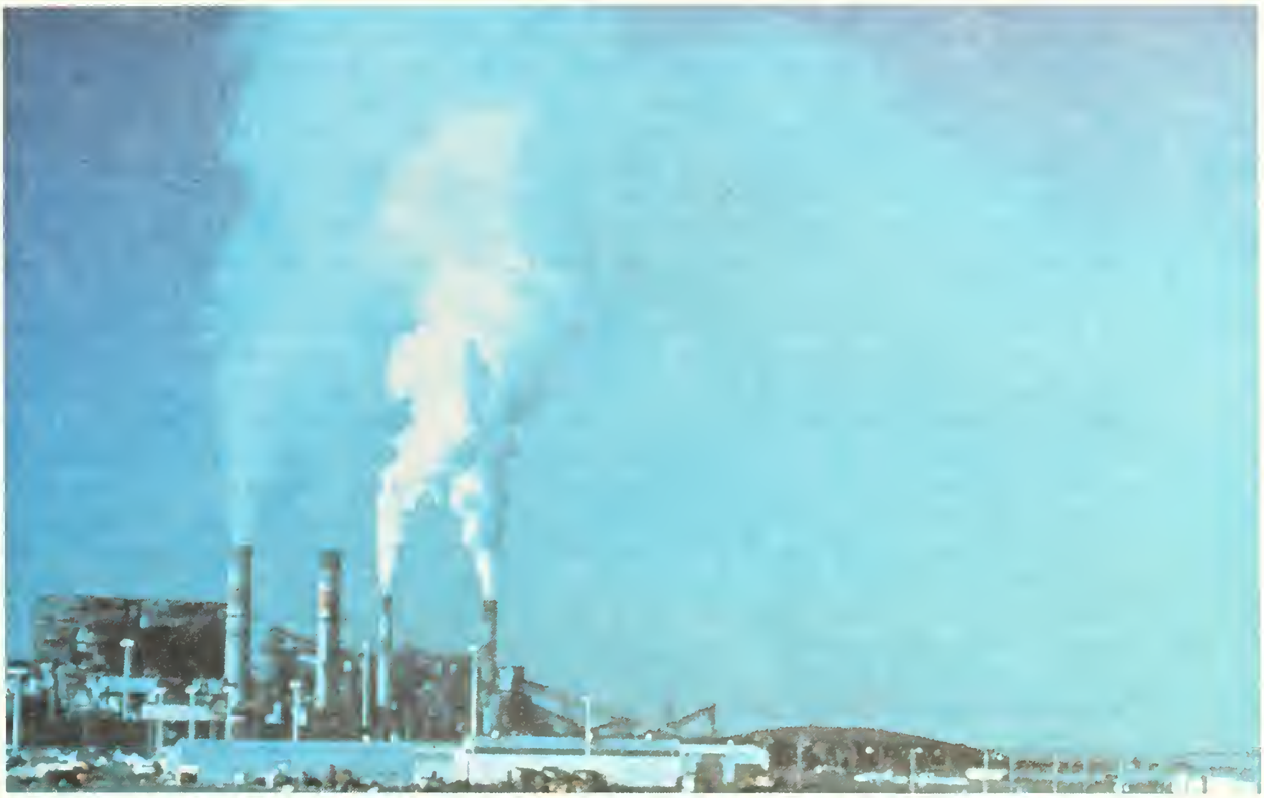
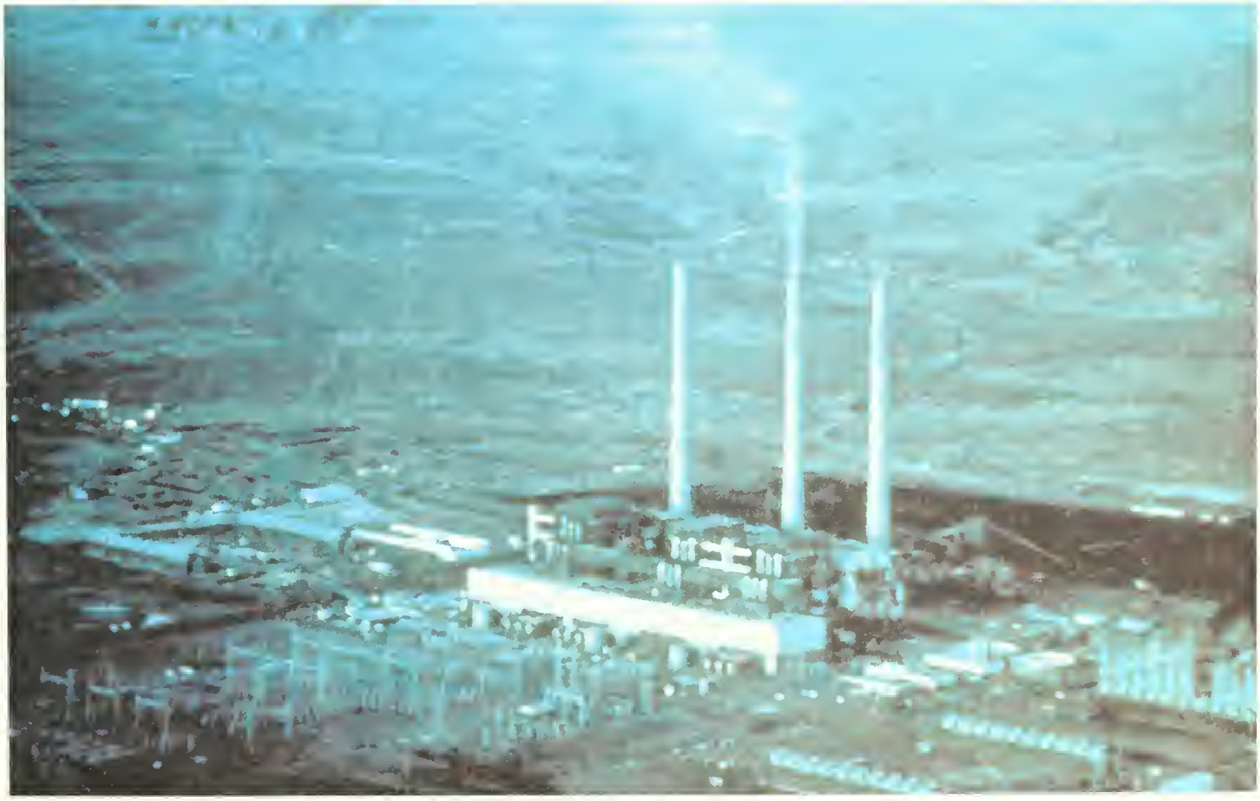


Figure 3. Four Corners Power Plant (above) and Navajo Power Plant (below) are two sources of sulfur dioxide in the Southwest (NPS photographs).



to other environmental problems: impairment of visibility as well as acidification of soils and waters from acid deposition. These are discussed below under "sulfate."

Nitrogen oxides (NO_x). Nitrogen oxides are gaseous pollutants which are produced when fuel is burned at high temperatures such as occur in vehicle engines, industrial boilers and electric power plants. The normal atmosphere is composed of about 78% nitrogen gas; during combustion at high temperatures, the nitrogen combines with oxygen in the air to form nitrogen oxide (NO). It is further oxidized in the atmosphere to form other oxides of nitrogen, the most important of which is nitrogen dioxide. Natural sources of nitrogen oxide (also called nitric oxide) include biological decay and forest fires. These natural sources, particularly biological decay, produce far greater amounts of nitric oxide than do manmade sources. Nevertheless, in localized areas, it is the manmade sources that cause significant pollution problems. Automobiles and large stationary sources of pollution (defined on page 27) such as fossil fueled power plants and industrial processes, are the largest emission sources of nitric oxide. In the atmosphere, this nitric oxide is further oxidized to nitrogen dioxide.

Nitrogen dioxide in the air has been found to cause irritation of the eyes, nose and throat and appears to increase susceptibility of humans and animals to infection. While it is regarded as less toxic to plants than SO_2 or ozone (see below), it does appear to restrict the growth of some plants. It is visible as a yellow-brown to reddish-brown gas and is the pollutant responsible in part for the brownish haze over some cities, for the visible plume from many coal-fired power plants, and for reduced visibility in many areas. It may be converted in the air into nitrate (NO_3-) or nitric acid (HNO_3) which pose additional environmental problems because of their associations with acid deposition and visibility impairment. These are discussed below under "nitrate".

Photochemical smog*. Photochemical smog, the haze which often is seen over large cities, is the result of the interaction of a variety of pollutants in the atmosphere in the presence of sunlight. In itself, smog is not a specific air pollutant, per se, but is an air pollution phenomenon composed of and resulting from emissions of various types of pollutants. Smog is composed of "photochemical oxidants" which are formed in the atmosphere from reactions involving sunlight, volatile organic compounds (e.g., hydrocarbon vapors from incomplete fuel combustion and fuel evaporation) and oxides of nitrogen (one of the largest products of all combustion processes).

Photochemical smog is known to cause eye and lung irritation and damage to vegetation, including various types of citrus and "salad" crops as well as various forms of native vegetation. In high concentrations it has an offensive odor and may be dense enough in some areas (especially large cities) to reduce visual range to less than three miles. (Three miles is the minimum visibility for safe operation of airplanes.) Of the photochemical oxidants comprising smog, ozone (O_3) is the most important and potentially the most damaging. See discussion below.

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* While not a specific pollutant, photochemical smog is listed here because it is a commonly used term for a widely occurring and damaging pollution problem.

Ozone (O_3). Ozone, a highly reactive and unstable form of oxygen, is the most toxic pollutant to plants commonly found. It is a by-product of a complicated series of atmospheric photochemical reactions, involving nitrogen oxides, hydrocarbons and carbon monoxide. Ozone has a pungent odor and a blue tint.

Ozone is produced from both natural and man-made activities. In the upper atmosphere--the stratosphere--ozone is produced naturally in the presence of oxygen, nitrogen oxides, and intense ultra-violet radiation. Ozone produced in the stratosphere protects the earth's surface from dangerous levels of ultra-violet radiation. Substantial amounts of ozone from the stratopheric layer occasionally enter the lower atmosphere--the troposphere--by natural processes.

The principal source of man-made ozone is the internal combustion engine. Although ozone is not a primary emission, the nitrogen oxides, carbon monoxide and hydrocarbons emitted from automobiles react in the presence of sunlight to form ozone.

Ozone is known to cause potentially serious injury and growth damage to various forms of vegetation including eastern white pines, hardwoods and ponderosa and jeffrey pines (See Figure 4). Additionally, its effects include damage to textiles, discoloration of dyes and accelerated cracking and disintegration of rubber.

Carbon monoxide (CO). Carbon monoxide is a colorless, odorless, poisonous gas which is extremely toxic to humans at low concentrations. Natural sources of carbon monoxide, such as forest fires and respiration by plants and plankton, make a minor contribution to the atmosphere. Most carbon monoxide, however, is derived from man-made sources as the result of the incomplete combustion of the carbon in fuels. Almost two-thirds of the carbon monoxide in the air comes from internal combustion engines and the vast majority comes from automobiles, trucks and buses. It is usually a localized pollution problem rather than one caused by emissions produced by and transported from sources miles away. Carbon monoxide emissions can be prevented by supplying enough air to assure complete combustion, since with complete combustion, carbon dioxide (a natural constituent of the atmosphere) is produced instead of carbon monoxide.

Health effects from carbon monoxide result from the fact that the compound replaces oxygen in the blood so that insufficient oxygen is available in the bloodstream to carry on necessary body metabolism. It has been found that CO-related health effects are exacerbated in higher altitude areas due to the reduced availability of oxygen in the air. Depending on the concentration of the pollutant in the bloodstream, its health effects range from dizziness and headaches to death. It is especially dangerous to people with heart disease, anemia, asthma and other respiratory ailments.

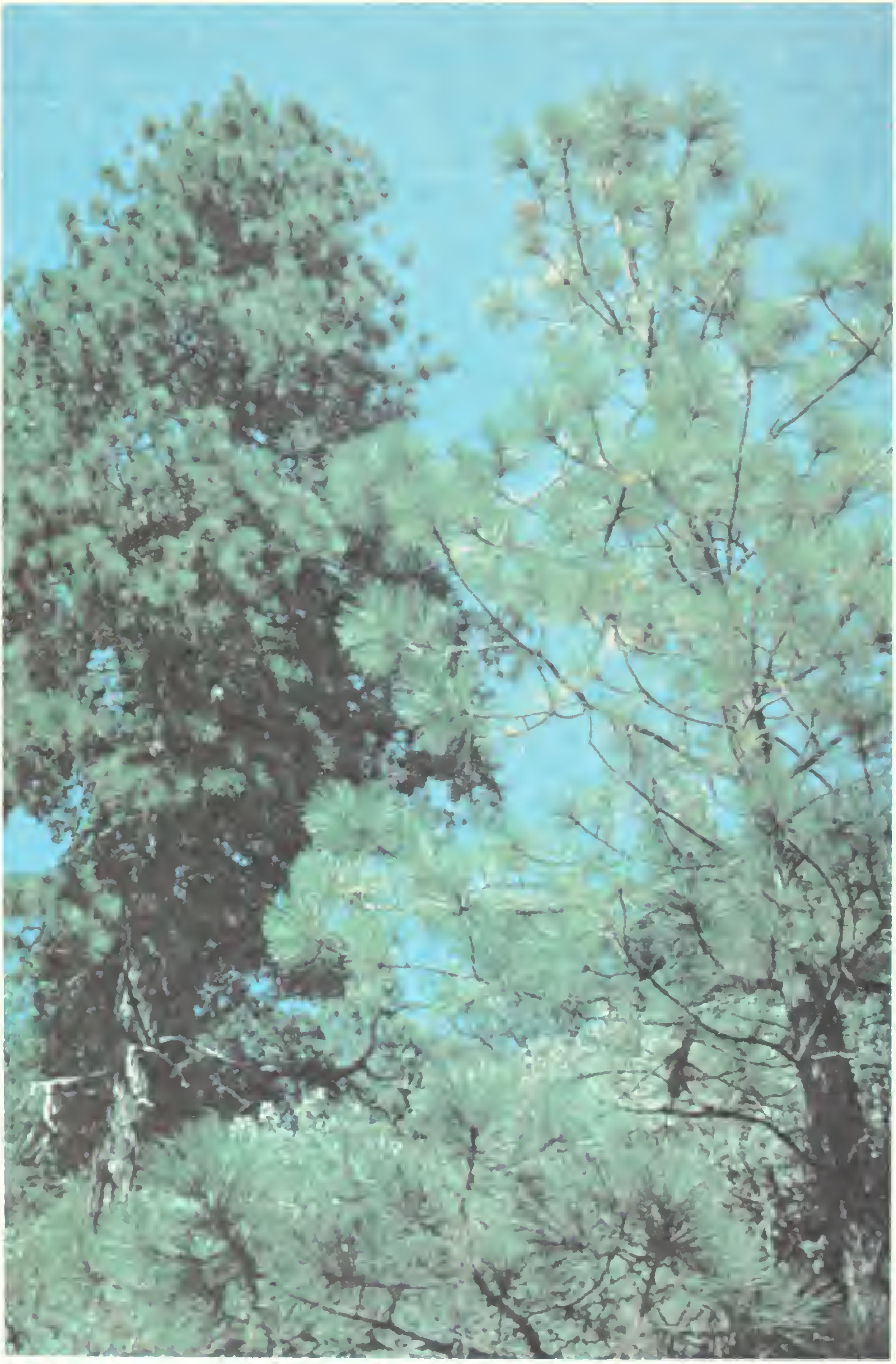


Figure 4. The effects of ozone on Ponderosa Pine at Sequoia/Kings Canyon National Park. The pine on the right is ozone sensitive while the one on the left is tolerant (NPS photograph).

Volatile organic compounds (VOC). Volatile organic compounds (most of which are also known as "hydrocarbons") are a category of gaseous air pollutants which, like carbon monoxide, result primarily from incompletely burned fuel. Principal natural sources of volatile organic compounds are vegetation, forest fires, marshes, natural gas, oil and coal fields. They also are released as a result of the evaporation of petroleum and petroleum products during production, transportation, storage and use. However, unlike CO, most of these substances usually are not directly toxic to human health or to vegetation or wildlife in the amounts normally found in polluted air. There are many sources of VOC pollution, but by far the major source is the combustion of gasoline in motor vehicles.

As discussed earlier, a principal pollution problem associated with VOC emissions is the occurrence of photochemical smog caused by a reaction between these substances and oxides of nitrogen.

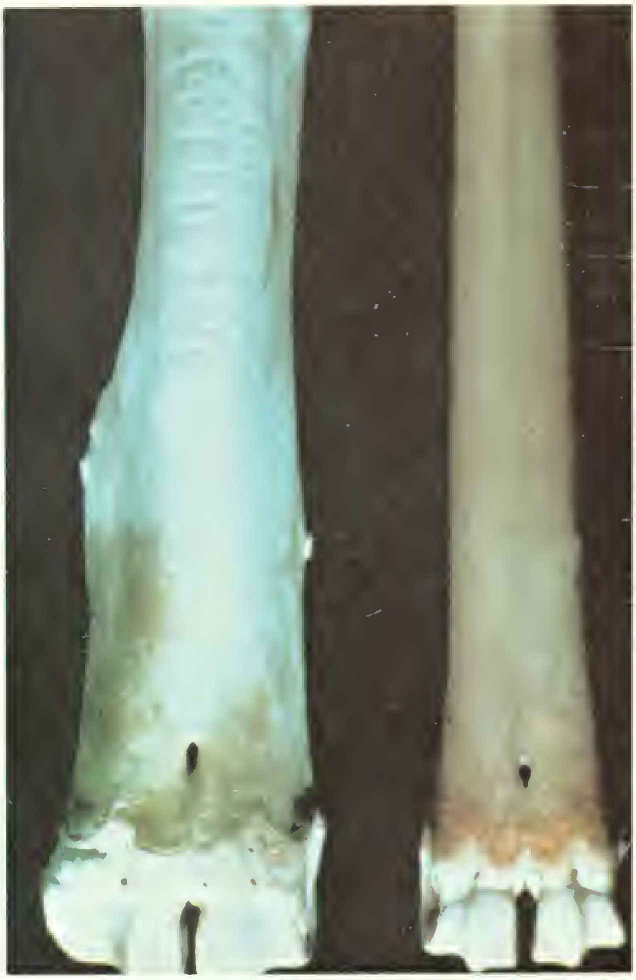
Hydrogen sulfide (H_2S). Hydrogen sulfide is another highly toxic and corrosive sulfur bearing pollutant compound whose presence is easily identified by its "rotten egg" odor. This gas may be emitted from natural sources such as geysers and swamps or other areas where natural decomposition is occurring. Man-made sources of hydrogen sulfide include flaring and production of so-called "sour" (i.e., H_2S-laden) natural gas, as well as certain petroleum, chemical, geothermal and metal refining processes, and some pulp and paper manufacturing.

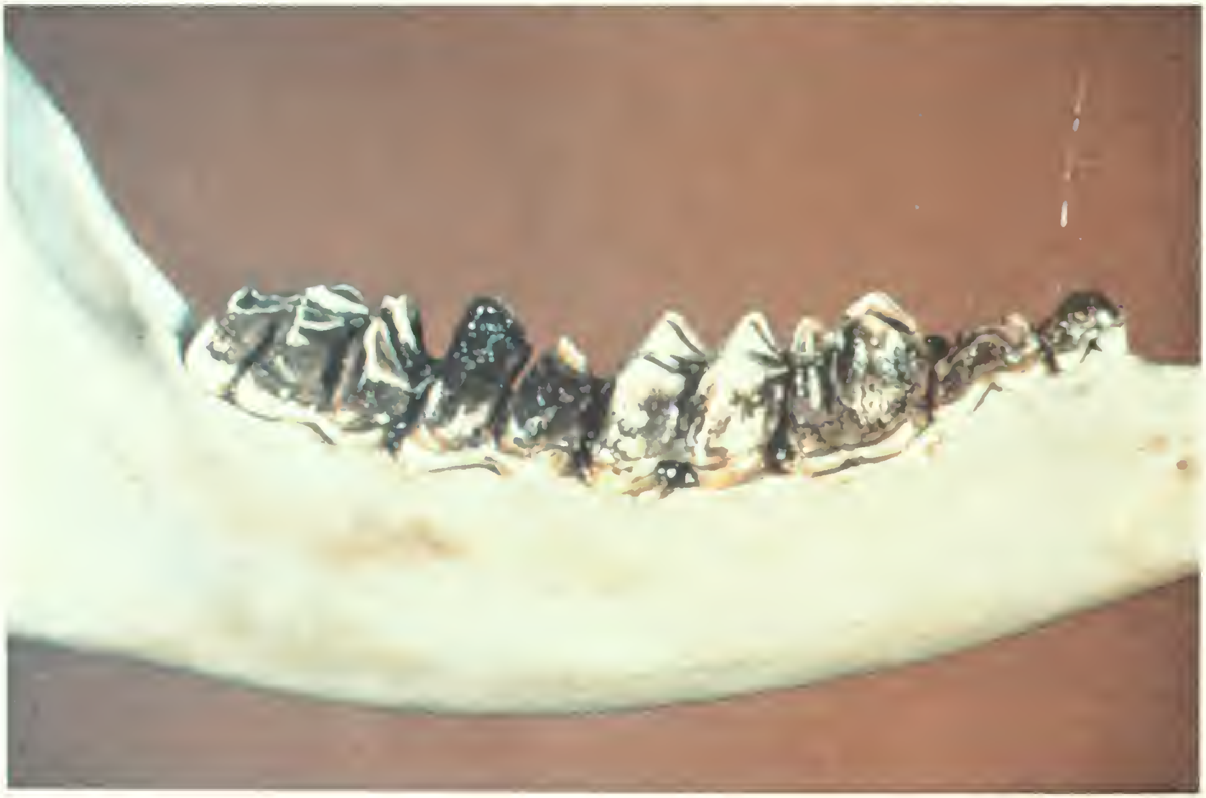
The objectionable odor of hydrogen sulfide emissions is perhaps the most obvious problem immediately associated with the pollutant. (At high concentrations, however, H_2S causes an impaired sense of smell, such that the odor generally associated with the compound may not be detected.) In sufficient concentrations, it is deadly to humans and animals. Other effects include deterioration and discoloration of lead-based paint and other building surfaces, and at high concentrations, damage to both the structure and the function of certain kinds of plant species.

Hydrogen fluoride (HF). Hydrogen fluoride is a gaseous pollutant which is readily taken up in various forms by plants and which, as a result, can be very damaging to vegetation and to wildlife for which such vegetation is a food source. Fluorides may be made available to plants and animals not only in the gaseous form of hydrogen fluoride (which is the most prevalent form of uptake) but also in particle form. Hydrogen fluoride is derived from emissions of various types of sources including phosphate mining, milling and processing, aluminum refining, iron and steel production, and manufacturing of brick, tile, and glass products.

Very low levels of hydrogen fluoride have been found to be damaging to plants; harmful effects include needle death in ponderosa and lodgepole pine, as well as leaf injury, leaf mortality and reduction in growth of firs, mosses and ferns. Of particular concern regarding fluoride pollution is the accumulation of fluoride in fodder plants which subsequently may lead to various toxic effects (including death) in grazing animals (See Figure 5). Chronic fluorosis resulting from long-term ingestion of contaminated fodder causes serious defects in teeth and bones as

Figure 5. The photographs show fluoride damage to mule deer metacarpals and teeth. Hydrogen fluoride emissions from a nearby aluminum reduction facility were deposited on the vegetation which was eaten by the deer (NPS photograph).





well as disruption of enzyme functions. Ultimate effects on grazing animals may range from loss of weight and appetite, to lameness, reduction in fertility and milk production and, eventually, death.

Particulate Matter (PM), Total Suspended Particulates (TSP)

"Particulate matter" (PM) is a general term which describes a variety of non-gaseous air pollutants. Another commonly used term for particulate matter is "total suspended particulates" or TSP. These pollutants may be particles of liquid or solid substances, they may be highly toxic or relatively harmless, and they may be organic or inorganic substances. Some particles are easily visible as dust, smoke or soot, whereas others may be less visible. Major sources of particulates include stationary fuel combustion operations such as electric power plants and industrial processes, as well as forest fires and mobile sources.

Effects associated with particulate pollutants are varied and numerous. Particulates can seriously impair visibility because of their ability to scatter light (particularly problematic in this regard are the very small, so-called "fine particulates"--see discussion below). When particulates are deposited on leaves or vegetation, the stomates (pores on the surfaces of leaves) can become clogged, interfering with respiration of the plant. Particulate pollutants also are responsible for much of the dirt and grime deposited on buildings in urban areas.

Some particulates are known to be extremely toxic to humans, animals and plants. Their effects can result from inhalation or from ingestion of vegetation or water contaminated by particles which have "fallen out" of the air. Arsenic, emitted from copper, lead and zinc smelters, is a well-known poison and a known cause of cancer. Beryllium, which has been found to produce malignant tumors in animals, is used in rocket fuels and in the production of metallic alloys. Fluoride particulates, as mentioned earlier, can cause severe damage to cattle and vegetation.

Airborne asbestos fibers, much of which come from the wearing away of automobile and truck brake linings, have been associated with chronic lung disease and lung cancer. Lead is another particulate pollutant which can cause severe health effects including damage to the brain and the central nervous system. Most of the lead in the atmosphere is from emissions of motor vehicles burning leaded fuels.

Fine Particle Pollutants

Although fine particle pollutants ("fines") are a sub-group within the category of particulate pollutants, they are treated separately here for the purpose of emphasizing the special nature of these materials. The word "fine" describes the very small size of these particles (less than 2.5 microns in diameter). Some general characteristics of fine particles are that: 1) once airborne, they can be transported very long distances before being deposited on plants or in bodies of water or in the soil; 2) they cause and contribute to reductions in visual range and acuity due to their ability to scatter light; and 3) they are small enough to evade the internal filtering systems leading to the lungs in humans and animals, and therefore can become lodged deep in lung tissue and cause serious damage. Thus, the hazards associated with fine particles relate not only to the toxicity of the specific compounds, but also to the problems associated with their fine particle form.

Two significant types of fine particle pollutants are sulfates and nitrates. These are discussed below.

Sulfate ($SO_4^=$). Not to be confused with sulfur dioxide (discussed earlier under "gaseous pollutants"), sulfate is not emitted in significant quantities from utility or industrial boilers, smelters, or other sources. Rather, it is a "derivative pollutant" formed in the atmosphere from emissions of sulfur oxides. Once this atmospheric conversion takes place, what was originally a gas is chemically transformed to particles of extremely small ("fine") dimensions. These particles then may be carried long distances by winds. One potentially significant effect of sulfate pollution is damage to the visual resources in and around the parks. Sulfate particles in the atmosphere are known to be one of the primary causes of region-wide visibility impairment (e.g., summer haze in the eastern United States).

Atmospheric fine particle sulfates ultimately may be deposited in dry form on soils, vegetation, etc., or may be "rained out" of the atmosphere in the form of sulfuric acid (H_2SO_4). This acid precipitation/ atmospheric deposition problem can lead to potentially serious environmental consequences such as water quality degradation, leaching of toxic metals from soils, and damage to habitats, food sources, etc., of various kinds of wildlife. Potential for environmental damage from acid deposition appears to be greatest in areas where soils are composed primarily of materials such as granite which have little "buffering" capacity, i.e., the ability to neutralize acid. Other types of potential damage from acid precipitation include bleaching and accelerated weathering of natural rock formations and of man-made materials and structures such as historical monuments.

Nitrate (NO_3^-). Nitrate is a derivative particulate pollutant formed in the atmosphere from nitrogen oxide emissions. As is the case with other fine particle pollutants such as sulfate, nitrate can be transported long distances by the wind and may cause visibility impairment both locally and on a regional basis. It may be deposited in dry or wet form (the latter, as nitric acid, HNO_3) significant distances away from the source of the primary nitrogen oxide emissions. It is the other major contributor to acid deposition, although in the United States, there is evidence that in most cases it is a less significant contributor than sulfate.

The following chart presents in summary form key information on the various pollutants discussed above.

Table II - 1

SUMMARY INFORMATION ON KEY POLLUTANTS OF CONCERN TO THE NPS

SULFUR DIOXIDE (SO_2)

General characteristics
- acrid gas
- atmospherically converted to acidic fine particulate, sulfate ($SO_4^{=}$)
- toxic concentrations to plants and animals begin as low 0.03 ppm.

Effects
- extremely corrosive to building materials, paint, metals
- damaging to human lungs in original and sulfate form
- causes chlorosis of leaves, necrosis of conifer needles
- very damaging to alfalfa, cotton, barley
  and other sensitive crops

Major Sources
- fossil fuel-fired power plants
- copper/lead smelting and refining
- industrial boilers (coal-fired)
- chemical production and processing
- oil refining
- natural gas processing
- kraft pulp and paper plants
- portland cement plants
- aluminum production
- oil shale extractions and processing
- tar sands extraction and processing
- coal gasification

Visual Signs of Effects
- chlorosis of leaf tissue in some species with veins remaining green some leaves may take on a water-soaked appearance later becoming desicated and bleached

NITROGEN OXIDES (NO_x)

General characteristics
- emitted in several forms, the most important of which is nitrogen dioxide (NO_2)
- NO_2 is a visible yellow-brown to reddish-brown gas
- atmospherically converted to acidic fine particulate, nitrate (NO_3^-)
- key pollutant contributor to photochemical smog

Effects
- eye, nose, throat irritation
- may increase susceptibility of humans and animals to infection
- suppresses plant growth at very low levels
- causes chlorosis of leaves
- impairs visibility in nitrate form

Major Sources

- coal-fired power plants
- diesel and gasoline - powered motor vehicles
- industrial boilers
- chemical production and processing
- oil refining
- natural gas processing
- kraft pulp and paper plants
- portland cement plants
- aluminum production oil shale extraction and process
- tar sands extraction and process
- coal gasification

Visual Signs of Effects

- suppressed plant growth
- brown cloud or plume

PHOTOCHEMICAL SMOG (photochemical oxidants)

General Characteristics

- results from atmospheric interactions of various pollutants
- most frequently results from interactions between hydrocarbon vapors and nitrogen oxides in the presence of sunlight
- is comprised of socalled "photochemical oxidants," the most signficant of which is ozone (O_3), which is a colorless, unstable gas with a somewhat sweet odor
- toxic concentrations of O_3 to plants begin as low as 0.06 ppm.

Effects

- produces a haze, especially near large cities, which interferes with visibility
- vegetation damage includes leaf drop in citrus trees, also chlorosis and "silver leaf" in various species
- high levels of smog and ozone cause eye irritation and aggravate respiratory problems
- ozone causes damage to paint, textiles, acceleration of cracking of rubber

Major Contributing Sources

- diesel and gasoline - powered motor vehicles, especially in urban areas
- fossil-fuel fired power plants
- copper/lead smelting and refining
- natural gas processing
- chemical production and processing
- oil refining
- oil and gas production
- coal gasification plants
- oil shale extraction and process
- tar sands extraction and process

Visual Signs of Effects

- obscuring of a previously visible view
- leaf spotting ("stippling") on upper surfaces of leaves, silver leaf, chlorosis
- cracking of rubber (hoses, tires, etc.)

CARBON MONOXIDE (CO)

General characteristics

- a colorless, odorless gas
- results from incomplete combustion of carbon in fuels
- extremely toxic to humans at very low concentrations
- tends to be found as a localized rather than a long-range pollution

Effects

- human health effects range from dizziness and headaches to death (especially dangerous to people with heart disease, anemia, and respiratory ailments)
- effects are worsened in high altitude areas due to lower atmospheric oxygen levels

Major Sources

- automobiles, trucks, buses
- fires

Visual Signs of Effects

- difficult to detect on the basis of visual signs

PARTICULATE MATTER (PM, TSP)

General Characteristics

- may be particles of liquid or solid, toxic or non-toxic, organic or inorganic materials
- may be easily visible, or so small as to be microscopic - small size "fine" particulates (primarily sulfate and nitrate) often cause worst effects (see next section FINE PARTICULATES page 18)

Effects

- depending on types of particulate pollutant, may cause cancer, damage to lungs, brain and central nervous system, and other human health problems
- interfere with metabolism, respiration of plants
- cause visibility degradation

Major Sources

- diesel-powered mobile sources
- almost all types of industrial processing, mining, and mineral processing, energy production facilities
- forest fires

Visual Signs of Effects
- leaf roll, wilting, necrosis
- soiling, discoloration of buildings, man-made materials
- visibility degradation

FINE PARTICULATES ("Fines", especially sulfates and nitrates)

General Characteristics
- may be any substance of extremely small particle size
- often are derivative rather than primary pollutants
- can be transported in the atmosphere over long distances
- can cause serious damage to human health via inhalation

Effects (vary with chemical composition of the particles)
- degradation of visual range and acuity
- acidification of soils, surface and ground waters and resultant effects of acidification
- particularly dangerous to fish populations reproducing in acidified waters
- leaching and corrosion of man-made materials

Major Contributing Sources
- all sources of SO_2, NO_x

Visual Signs of Effects
- increased eutrophication of lakes, ponds
- regional haze reducing visual range and activity
- reduced fish populations in lakes and streams
- leaf spotting from acidic rain

HYDROGEN SULFIDE (H_2S)

General Characteristics
- highly toxic and corrosive gas
- easily identified by unpleasant "rotten egg" odor
- produced from natural sources (e.g., swamps, geysers) as well as from man-made sources

Effects
- may be deadly to humans and animals
- causes structural and functional damage to plant species

Major Sources
- copper/lead smelting and refining
- natural gas processing
- oil and gas production

- oil refining
- kraft pulp and paper plants
- chemical production and processing

Visual Signs of Effects

- light brown-white scorching on inner veinal areas of leaves

HYDROGEN FLUORIDE (HF)

General Characteristics

- gaseous pollutant which is readily taken up and accumulated in meadow and pasture plants
- can be extremely dangerous to grazing animals because of potential for fodder plants to accumulate toxic quantities from the air
- toxic concentration to plants and animals begin as low as 0.0001 ppm.

Effects

- disruption of metabolic processes and internal injury to plants leading to needle death, leaf injury and mortality
- tooth and bone defects, and other effects possibly leading to death in grazing animals

Major Sources

- aluminum production
- coal-fired power plants
- coal gasification plants

Visual Signs of Effects

- marginal necrotic areas on leaves bounded by reddish band
- loss of weight, appetite, reduced lactation and fertility in grazing animals

AN APPROACH TO UNDERSTANDING AIR POLLUTION PROBLEMS

In approaching air pollution problems, there are several basic questions which, if systematically posed and examined, provide a useful investigative method for analyzing and understanding such problems and their potential harmful consequences for park area resources. These basic questions relate to the types of air pollutants of greatest concern, the sources of these pollutants and their potential effects on park resources. To the extent that park level or regional staff are able to anticipate and/or begin to gather the data necessary for responding to these questions, the process of fully defining the problem and determining what, if any, recourse is necessary can be greatly facilitated.

The discussion begins with a listing of these key questions. Following this listing, the relevance of each question is briefly explained and, where appropriate, additional detail is provided.

Some Basic Air Resource Questions

1. Which park resources, if any, are known to be, or potentially may be, affected by the pollutant? What are those effects?

2. What are the current and/or projected levels of the pollutant(s) in the ambient air?

3. Are the measured or projected pollutant levels high enough to cause those effects?

4. What is/are the actual source(s) of the pollutant?

5. What can be done to control/mitigate the pollutant's emissions and effects?

Which Park Resources, if any, are known to be, or Potentially may be, Affected by a Pollutant? What are Those Effects?

Once it has been determined that certain pollutants exist in an area, or that certain types of sources known to emit large quantities of particular pollutants exist or are proposed in that area, another question arises: Which park resources, if any, might be damaged by those pollutants? One way to answer this question is to ask what resources exist in the park whose welfare depends on good air quality. Such resources or "air quality related values" (AQRVs) may include vegetation, wildlife, soils, water resources, structures or items of particular cultural and historic significance, visual air quality, or any other air dependent resources in a park unit.

If National Park Service field or regional personal note or suspect the occurrence of an air pollution related problem, expert assistance should be sought as quickly as possible. However, to help in determining whether air pollution may be affecting AQRVs in an NPS unit or whether expert assistance should be sought, some general information is provided below.

In general, knowledge about the effects of air pollution--particularly on many wild and/or exotic species--is not extensive. In a few cases, however, researchers have determined that certain ranges or levels of given air pollutants cause various effects in specific species. More often, it has been possible only to identify certain species, particularly plant species, which are extremely sensitive to harmful air pollutants. These "indicator" species may be affected at much lower pollution levels than other species, or they may be affected at the same level of pollution as other species, but much more quickly or more seriously. For example, one of the plant types which has been found to be highly sensitive to air pollution is the lichen. Specifically, certain species of lichens may be seriously damaged by sulfur dioxide at lower concentrations than many other types of vegetation. Thus, because of their sensitivity to air pollution, they may show that an air pollution problem exists before other higher forms of vegetation would indicate the existence of a problem. Air pollution effects on other forms of vegetation include needle necrosis* in conifers (from SO_2, ozone, fluorides), leaf spotting (ozone, sulfates, nitrates), leaf drop (ozone), and suppression of growth.

Another particularly sensitive air pollution indicator is visual air quality. In areas with very clean air, the introduction of relatively small quantities of some pollutants (e.g., nitrogen dioxide and fine particulates such as sulfates and nitrates) may cause a noticeable loss of visual range and atmospheric clarity, greatly reducing the sharpness of images seen at medium to long distances (beyond ten miles). These pollutants also will change the apparent color of objects viewed through the contaminated atmosphere and will tend to "haze out" the deep blue color of the sky.

Yet a third pollution indicator might be the acidity of lakes and streams (and rainfall and snowpack) and/or changes in certain aquatic organisms which demonstrate high sensitivity to changes in water acidity.

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* The following terms are used to describe common types of vegetation damage correlated with air pollutants:

Necrosis:	killing of tissue
Chlorosis:	destruction of chlorophyll resulting in the blanching of leaves from green to yellow or white
Epinasty:	a downward curvature of the leaves due to a higher rate of growth on the upper surface
Leaf abscission:	the dropping off of leaves
Silver leaf:	a pathological condition of leaves in which they develop a silver or bronze glazing on their lower surfaces

(Air Pollution Control Guidebook for Management, Stamford: E.R.A. Inc., 1969)

As indicated above, the effects of a particular pollutant are not related solely to the amount or magnitude of that pollutant in the air. For example, the following also bear upon the degree of impact of a pollutant on particular resources, or upon an entire ecosystem:

Type of effect. Is the effect on visibility? On plants? Animals? Humans? Does the effect become apparent soon after exposure to pollutant emissions or does it remain "invisible" for long periods of time after exposure (i.e., is the effect acute or is it chronic)? Can the effect(s) of the pollutant in question be both acute and chronic? Is the effect primarily superficial or structural (e.g., spotting on leaves) or is it more functional (e.g., major tissue/organ damage)?

Extent of effect. Does the pollutant affect only individual embers of a species or does it affect the entire population of that species? Is the effect limited to the local area or is it broader in geographic extent?

Frequency and duration of effect. Does it occur only sporadically, does it occur regularly at certain times of year, or does it occur throughout the year (e.g., it might coincide with times of heavy visitor use or with key stages in flora/fauna reproductive cycles)? Does the effect occur only for short periods of time or is it long-lasting?

Important features of the receptor(s) (i.e., resource or species affected). Is the receptor a dominant species of plant or animal? Is it an endangered or threatened species? Is the receptor visual air quality in an area where undegraded visibility is essential to the visitor's experience?

Susceptibility of receptor(s). Is there an existing disease condition in the receptor species population which renders it more susceptible to air pollution damage? Are there other existing conditions, e.g., drought, extreme heat or cold, or other meteorological conditions which have rendered the receptor(s) more susceptible to air pollution damage?

Potential for synergistic effects. Are there other pollutants in the atmosphere or elsewhere in the environment which, in combination with the air pollutant in question, may result in receptor damage even though the level of each pollutant by itself ordinarily would not cause such an effect (e.g., ozone and sulfur dioxide interacting to damage plant species)?

It is important to note that in many cases, particularly in wild, natural environments, it is very difficult to observe air pollution related damage in its early stages. Specifically, only damage to visibility and certain vegetation types may be clearly and easily documented as resulting from air pollution. Other effects on other AQRVs are particularly difficult to definitively document. Moreover, often it is even more difficult to reliably distinguish the damage due to specific air pollutants from damage resulting from a variety of other possible agents (such as drought or disease). Table II-2 briefly summarizes some of the harmful effects which can occur as the result of air pollution, and, in some cases, ways in which such effects can be documented in the field.

Table II - 2

SOME COMMON EFFECTS OF MAJOR AIR POLLUTANTS

POTENTIAL EFFECTS	POLLUTANTS
Visibility effects visible smokestack plumes layered haze regional haze atmospheric discoloration reduction of visual range reduction of atmospheric clarity reduction of visual contrast of distant objects discoloration of distant objects	nitrogen dioxide fine particulates (especially sulfates and nitrates) photochemical smog
Simple means of documentation: human observation, photography	
Vegetation effects superficial damage to leaves, conifer needles and fruit changes in growth rates and/or suppression of growth disruption of reproductive processes increased susceptibility to disease, pests, adverse weather conditions other forms of stress loss of individuals or large numbers of a community or possibly significant alterations in entire terrestrial and/or aquatic ecosystems	ozone sulfur dioxide nitrogen dioxide flouride acid deposition (including sulfates and nitrates) metals
Simple means of documentation: field surveys, sample collection, photography	
Animal effects eye and respiratory impairment increased suseptibility to other agents or to disease decreased availability of necessary food sources loss of teeth crippling effects reduction of reproduction capacity in certain aquatic species (effects may occur through a variety of routes including direct respiration of pollutant or through ingestion of contaminated food or water)	ozone sulfur dioxide nitrogen dioxide flouride acid deposition (include sulfates and nitrates) arsenic lead and other metals

Soil effects	
acidification toxification depletion (leaching of essential nutrients)	acid deposition (including sulfates and nitrates) metals
Water quality effects	
acidification toxification eutrophication	acid deposition metals phosphates particulates
Effects on natural and man-made structures	
discoloration and/or erosion of building facades decomposition, soiling of limestone formations, Indian ruins and artifacts	acid deposition ozone particulates nitrogen dioxide
Odor effects	
	hydrogen sulfide nitrogen dioxide ozone
Human health effects	
eye irritation respiratory irritation and impairment toxic poisoning (CO poisoning)	ozone nitrogen dioxide particulates (including fine particulates) carbon monoxide lead and other metals sulfur dioxide fluoride

What is the Measured and/or Projected Level of the Pollutant in the Ambient Air?

Determining the level of a given pollutant in the ambient air is generally a complicated and difficult endeavor. This information is important because it allows the tracing of apparent effects back to a particular pollutant emission and source of concern. On-site monitoring of individual air pollutants, visibility and AQRVs is one way of ascertaining pollution levels. Another way of estimating pollutant levels is through development of a mathematical formula or model, which, when applied to situations where other information about emissions and/ or effects is known, allows predictions to be made about levels in the ambient air. However, in the cases both of monitoring and modeling to predict ambient pollution concentrations, the science is not exact and varying degrees of uncertainty are associated with determinations derived through either means.

Despite these analytical uncertainties and limitations, arriving at estimates of the levels of given pollutants in the air is an important step in approaching air pollution problems. Equally important as determining pollution levels is establishing the period of time during which an exposure to these particular levels of pollutants occurs. In many cases, harmful effects can occur through short-term exposures to high pollution levels, through longterm, or repeated exposures to low levels, or both. Also, some pollutants pose greater danger when certain levels of other air pollutants also are present. Thus, the question of how much pollution is in the air and the resultant exposure which may occur cannot simply be answered by determining the peak level reached by a given pollutant. Rather, in order to determine the potential for air pollution induced damage, the following factors are important:

Background level. The level of a pollutant which naturally occurs in the environment in a given area. (In most cases, definitive information of this kind is not available. The best information on background pollution levels is obtainable on the basis of known historical trends of pollutant levels in a given area.)

Peak concentration. The highest level of a pollutant which is reached in the air.

Baseline concentration. The ambient concentration level of a pollutant which exists at the time of the first application for a permit by a proposed source for a given area; it is determined on the basis of monitoring data on existing natural and man-made sources of the pollutant and on projections or estimates of future emissions from other proposed emission sources.

Frequency and distribution. How frequently particular levels of a pollutant occur and how they are distributed over the course of a year. (For example, harmful levels might occur infrequently, but at times of the year when organisms are particularly sensitive, e.g., at crucial times in animal or plant reproduction or growth cycles.)

Duration. The length of time during which particular levels of pollution occur.

Are the Measured or Projected Pollutant Levels High Enough to Damage Park Resources?

As mentioned earlier, some data exist on the various effects on resources caused by specific levels of certain pollutants. As a general rule, however, determinations about the levels of particular pollutants in the air, and about the actual effects that may occur at any given pollution level (the "dose-response" relationship), ultimately can be made only by an air pollution effects specialist. Such a specialist needs to know the identities of the pollutants in question, their individual background levels, their peak levels (and their frequency, duration and distribution if actual monitoring data are available), and any other existing conditions which may weaken a potentially affected species, thereby making it particularly susceptible to air pollution damage. Where air pollution monitoring has not been conducted, such an expert will seek additional information about the evidence of damage to indicator species and the types and sizes of pollution sources in the area.

Where air quality monitoring has not been conducted, or where it is impossible to continuously monitor, a resource manager may wish to consider establishing a periodic, systematic survey of plant species or other pollution indicators, such as those discussed above. Such a program of sensitive indicator monitoring could be used to document changes in the resource base which may be related to air pollution and to determine the need for more extensive, technology-based pollutant and/or visibility monitoring systems. A carefully documented inventory of these types of indicators, conducted over time, may provide valuable early warning of the presence of potentially serious air pollution.

What is/are the Source(s) in that Area of the Pollutant(s) in Question?

Many types of pollutants have natural as well as man-made origins. For example, particulates are emitted from forest and range fires or may be swept up from dirt roads, open fields, etc., by the wind. Sulfur dioxide and fluorides can be vented by volcanoes. Hydrogen sulfide is released from geysers. Ozone and other oxidants can move downward into the lower atmosphere from the stratosphere during unstable meteorogical conditions, e.g., frontal passages and violent thunderstorms. Ozone also can be formed by the combination of hydrocarbons emitted by certain types of vegetation with nitrogen oxides produced by decomposing vegetation. If the source of pollution affecting a park's resources is wholly or largely natural in origin, options to control or prevent damage may be quite limited.

If the pollutant is from a man-made source, then it may be emitted by one or more of the following source types:

Stationary source. A pollutant source which is in a fixed location; may be characterized further by any of the following terms:

> Point Source - A stationary source which emits pollutants from one or more discrete, controllable sites (may be a single smokestack or a complete smelter or power plant with multiple emission stacks) (See Figure 6).
>
> "Fugitive" Source - A stationary source which emits "fugitive" emissions from a variety of non-point, uncontrolled sites (e.g., unpaved roads, coal piles). "Fugitive" emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening.
>
> Area Source - A stationary source which emits pollutants from a broad area rather than a fixed point; usually consists of a well-defined area within which are located a number of small sources (e.g., an entire residential area, a block of commercial enterprises concentrated within one section of a city) (See Figure 7).

Mobile Source. A pollutant source which moves from place to place, emitting while in motion (e.g., car, truck, ship, etc.) (See Figure 8).

Table II-3 provides a matrix of the major types of sources and associated pollutants which may be located (or proposed for location) near National Park Service units. Additionally, following the matrix is a more detailed chart, Table II-4, which presents pollutant sources by source category and lists the major pollutants emitted by each type of source.

What can be Done to Control/Mitigate the Pollutant's Emissions and Effects?

This question forms the real basis for management action by park personnel. There is a range of actions which can be taken by the National Park Service in general, and by park level personnel in particular, to help control pollutant emissions and to prevent or mitigate air pollution damage to park resources. These air resource management actions and options are discussed by major type of activity in the Section "KEY NPS AIR RESOURCE MANAGEMENT ACTIVITIES" (pg. 39).

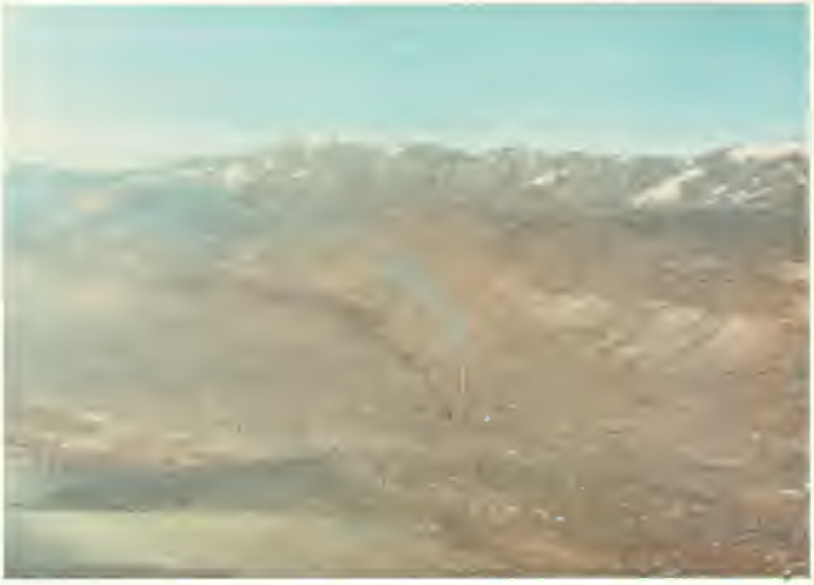


Figure 6. Point source, McGill Copper Smelter near McGill, Nevada (NPS photograph).

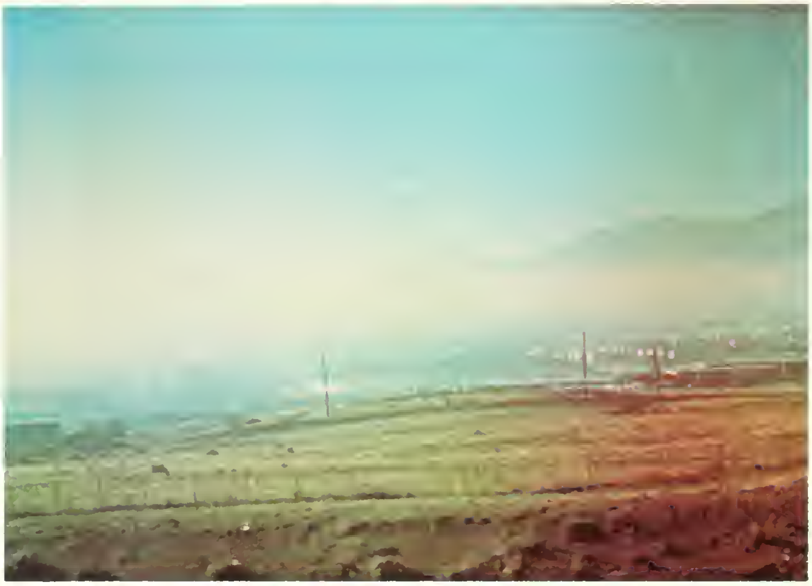


Figure 7. Area source, urban haze in Reno, Nevada (Air Resource Specialists, Inc. photograph).

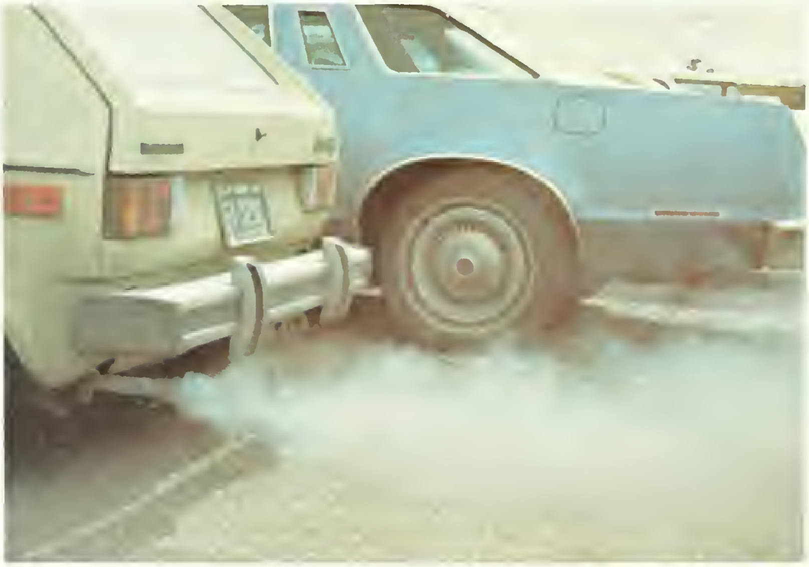


Figure 8. Mobile source, diesel powered automobile (NPS photograph).

Table II - 3

Types of Major Primary or Derivatives Pollutants by Major Source Category

SOURCES POLLUTANTS

	Primary									Derivatives		
	SO_2	NO_x	PM	VOC	H_2S	F	CO	Pb	As	O_3	SO_4	NO_3
Coal Mine - Surface			X									
Coal-fired Power Plant	X	X	X			X		X	X		X	X
Coal Gasification Plant	X	X	X	X		X		X	X	X	X	X
Oil Shale Extraction and Processing	X	X	X	X				X		X	X	X
Kraft Pulp and Paper Plant	X	X	X		X				X		X	X
Hard Rock Mining Underground			X									
Mineral Ore Milling			X									
Copper/Lead Smelting and Refining	X		X		X			X	X		X	X
Portland Cement Plant	X	X	X								X	X
Oil and Gas Exploration			X									
Oil and Gas Production			X	X	X					X		
Tar Sands Extraction and Processing	X	X	X	X						X	X	X
Oil Storage and Transfer				X								
Oil Refining	X	X		X	X					X	X	X
Natural Gas Processing	X	X		X	X					X	X	X
Industrial Boilers Coal-fired	X	X	X								X	X
Chemical Production and Processing	X	X	X	X	X	X				X	X	X
Urban Population Concentrations	X	X	X	X			X	X		X	X	X
Aluminum Production	X	X	X			X					X	X
Mobile Sources Diesel		X	X	X			X			X		
Mobile Sources Gasoline		X		X			X	X		X		

Table II - 4

Sources of Air Pollution Potentially Affecting NPS Units

Combustion Sources (non-energy processing/production)

Stationary Sources

- Industrial boilers (PM, SO_2, NO_x, CO, trace metals)
- Wood waste burners (PM, NO_x, CO)
- Refuse incinerators (PM, NO_x, trace metals, CO)
- Open burning of solid waste (PM, NO_x, trace metals, CO)
- Fires (PM, NO_x, CO)
- Slash burning (PM, NO_x, CO)
- Fireplaces, woodstoves, campfires (PM, NO_x, CO)

Mobile Sources (all mobile sources emit hydrocarbons, carbon monoxide, nitrogen oxides)

- Light duty cars and trucks
- Heavy duty trucks (diesels emit above plus PM)
- Airplanes
- Ships (above plus PM and SO_2)
- Railroad engines (above plus PM, SO_2)
- Buses

Energy Production and Conversion

- Fossil fuel-fired electrical generators (PM, SO_2, NO_x, trace metals)
- Fossil fuel-fired industrial boilers (same as above)
- Oil shale operations (above plus volatile organic compounds, cadmium)
- Coal gasification/liquefaction (above plus volatile organic compounds)

Mineral Products Industry

- Asphalt plants (PM, volatile organic compounds)
- Coal mining and cleaning (PM)
- Concrete batch plants (PM)
- Glass plants (PM, fluorides)
- Hard rock mining and milling (PM)
- Limestone mining and milling (PM)
- Phosphate rock mining and milling (PM, fluorides)
- Portland cement plants (PM, SO_2, NO_x)
- Sand and gravel extraction and processing (PM)

Metallurgical Industry

- Primary and secondary aluminum production (PM, fluorides)
- Coke ovens (PM, SO_2, trace metals, H_2SO_4, H_2S)
- Copper, lead and zinc smelters (PM, SO_2,SO_3, H_2SO_4, arsenic, lead)
- Foundries (PM, SO_2, trace metals)
  Iron and steel mills (PM, SO_2, trace metals, H_2S)
- Uranium processing (PM, SO_2, NO_x, radionuclides)

Petroleum Industry

- Oil and gas exploration and drilling (PM, H_2S, volatile organic compounds)
- Oil and gas production (volatile organic compounds, H_2S)
- Oil refining (SO_2, H_2S, volatile organic compounds, NO_x)
- Natural gas processing (SO_2, H_2S)
- Tar sands extraction and processing (PM, SO_2, NO_x, volatile organic compounds)

Chemical Industry

- Acid plants (various acids in the form of particulates, gases and mists)
- Chemical processing and/or production plants (volatile organic compounds, SO_2, NO_x, hazardous pollutants)
- Fertilizer plants (acids, volatile organic compounds, SO_2, PM, fluorides)
- Rubber production plants (SO_2, PM, volatile organic compounds)
- Sulfur recovery plants (SO_2, SO_3, H_2SO_4, H_2S, PM)

Wood and Paper Industry

- Kraft pulp mills (PM, SO_2, NO_x, H_2S)
- Paper plants (PM, SO_2, NO_x, H_2S)
- Lumbermills (PM)
- Woodworking operations (PM)

Agricultural Industry

- Crop drying operations (PM, NO_x)
- Feed and grain mills and elevators (PM)
- Sugar cane processing (PM, SO_2, NO_x)

Evaporative Emission Sources

- Dry cleaning (volatile organic compounds)
- Petroleum storage and transfer (volatile organic compounds, SO_2)
- Surface coating and painting (volatile organic compounds)

Fugitive Emission Sources (all of which normally emit large volumes of PM)

- Aggregate storage piles
- Agricultural tilling
- Heavy construction operations
- Unpaved roads
- Urban population concentrations (PM, O_3, NO_x, a variety of organic particulates and gases)

NPS AIR RESOURCE MANAGEMENT

MISSION STATEMENT

The NPS mission with respect to air resource management has two major objectives: (1) to protect park resources and (2) to assure visitor enjoyment of the park and its resources. These objectives are based on authorities contained in the NPS Organic Act of 1916, the individual acts establishing the parks, the National Environmental Policy Act of 1969, the Clean Air Act as amended in 1977 and a number of other statutes (summarized briefly in Appendix 3). The NPS Organic Act declares that:

> The National Park Service shall promote and regulate the use of the federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations. (U.S.C. title 16, sec. 1)

In addition, many of the individual acts (or their legislative histories) which establish parks, monuments or other special areas also make clear the NPS responsibility to protect park resources from air pollution-related damage. For instance, there are numerous references in the laws or in their accompanying histories which indicate Congress' clear intention of protecting all the natural values of these areas for "the benefit and enjoyment of the people", of protecting "the superlative scenic features" of the parks, and of preserving the unique cultural, historic and natural features of these areas.

In order to accomplish the air resource management mission, NPS must perform the following general activities:

- Determine the ambient air pollutant levels and visibility in the park by monitoring or modeling.

- Determine those park resources that may be affected by air pollutants.

- Evaluate the effects of air pollutants on the park resources and on visitor enjoyment at the ambient levels found in the park.

- Take steps to mitigate air pollution damage.

In order to carry out these responsibilities effectively, NPS staff must become aware of air pollution influences on park resources as early as possible. Early warning of potential air pollution effects on the parks allows NPS staff to track these potential impacts. In addition, early awareness of potential effects triggers NPS actions to prevent harmful impacts on park resources and visitor enjoyment.

The internal organizational components of NPS which are involved in carrying out the air resource management mission are discussed below. In addition, the role of the Secretary of Interior in carrying out the air resource management mission is briefly discussed including the delegation of certain authorities.

NPS ORGANIZATIONAL UNITS RESPONSIBLE FOR AIR RESOURCE MANAGEMENT

The NPS contains specific organizational units and personnel whose functions are to carry out the NPS air resource management activities. The following discussion describes the air resource management functions at three levels within the NPS: the park level, the regional level, and the Washington office (WASO) level.

Park-Level Air Resource Management Roles

Park staff have a uniquely important role in carrying out the air resource management mission. Their contribution is essential because they are in the position closest to the potentially affected resources. This proximity allows park staff to develop an especially useful awareness of the quality of the air in the park and its surrounding region. It also enables the park staff to develop a familiarity with the area's air quality related values (AQRVs) and an awareness of air pollution effects on the AQRVs. In some circumstances, park personnel may have important opportunities to prevent or remedy air pollution damage by their direct actions, (e.g., through careful management of prescribed burns, modification of automobile traffic patterns in the park, etc.)

Park staff routinely perform many important functions related to the air resource management mission. They are actively involved in visibility monitoring, effects monitoring, and resource cataloging. Also, park staff are uniquely situated for providing the region and the Air Quality Division (AQD) with early information regarding potential air pollution influences on the park. The AQD office maintains an "early warning system" which catalogues potential and proposed developments which may impact the park's AQRVs. (For more information see Washington Office Air Resource Management Roles, pg. 34). Only through early warning functions provided by park staff can NPS effectively track potential new impacts to the parks and initiate activities to prevent harmful impacts on AQRVs.

Another important mission-oriented activity that park staff should become involved with is NPS air resource planning. Park staff can identify and prepare air resource management objectives for inclusion in the park's Statement for Management. They can also prepare those sections of the General Management Plans (GMPs) or Resource Management Plans (RMPs) which relate to air resource management objectives. (NPS Planning is discussed in more detail in KEY NPS AIR RESOURCE MANAGEMENT ACTIVITIES, pg. 39).

In addition, an important activity of park personnel related to air resource planning and management is the identification and ranking of the possible needs for specific, park-centered, air quality related projects or activities. Park staff are also responsible for preparing requests for funding of these projects. Such funding requests routinely are sent to the NPS region where they are priority ranked with other requests from that region and then submitted to the Washington office for consideration for funding.

Another important activity of park personnel is informing the public about the importance and value of the air resource through various interpretive programs.

Regional Office Air Resource Management Roles

Each NPS regional office performs a significant air resource management coordination function. In general, the region coordinates not only air related activities within that region, but also those activities involving the region, the parks and the Washington office. Thus, park staff interact with regional staff in order to coordinate their air resource related activities with the activities of other parks involved in regional activities or with activities in the Washington office.

Coordination activities at the regional level include: planning, monitoring, research, and environmental assessment (EA) and environmental impact statement (EIS) activities. Another important regional function is the review of air quality related project requests from the parks. As mentioned above, regional personnel are responsible for establishing priorities among the projects needed by various NPS units in the region and submitting the ranked list of projects to the Washington office for consideration of funding. The regions are also responsible for reviewing the Resources Management Plans, the Statements for Management, and other planning documents to ensure that air quality issues are adequately addressed. In addition, regional personnel generally are responsible for coordination, final preparation and submittal of NPS comments on new source applications for air pollution control permits.

Washington Office Air Resource Management Roles

The air resource management responsibilities of the Washington office rest in the Air Quality Division. The AQD technical support offices are located in Denver and Ft. Collins, Colorado. The AQD has primary responsibility for the NPS air resource management program. Many air resource related activities performed by park staff are funded directly by the AQD and the AQD provides air resource management direction and guidance to park staff.

The NPS Air Quality Office was established in 1978 to serve several major purposes. These are:

To provide support to the NPS Director and the Secretary of the Interior. This involves such activities as: (1) developing testimony for Congressional hearings on air quality issues which may affect parks; (2) preparing supporting materials for use in work with other bureaus, agencies, and departments on policies or activities with potential air quality impacts on parks; (3) participating in the development and review of Environmental Impact Statements (EIS) for projects which may affect air quality in parks; (4) reviewing, analyzing and developing policy positions on proposed federal, state and local regulations, legislation or management activities that may impact park resources; and (5) reviewing all air quality permit applications for major new and modified industrial facilities whose activities may affect AQRVs in parks. Thus, the AQD is primarily responsible for overseeing and coordinating overall NPS compliance with the applicable air quality requirements.

To provide policy and technical information and assistance to the parks and regions. The AQD provides air resource planning and management guidance and support (including special project funding) to parks and regions. The AQD's technical staff assists park and regional personnel in their efforts to identify, document, prevent, mitigate and remedy damage to park resources from air pollution. It is important to note that technical assistance which the AQD provides to the parks and regions is available at no cost. In fact, the AQD is a source of funding for special air quality projects. In addition, AQD personnel are available to work on specific air resource projects.

To plan, design, and implement air quality related research. The AQD designs, and conducts, air quality related research for the purposes of (1) accurately describing the causes and effects of park air pollution problems and (2) seeking solutions to current problems resulting from air pollution in the parks. In addition, the AQD coordinates the collection of baseline data for air pollutants and visibility.

In allocating its staff and funding resources, the AQD applies a set of criteria and ranking factors.

Each project/study must meet each of the following screening criteria to be considered for funding or for requesting increases in the Servicewide Air Quality account:

1. MUST BE WITHIN THE SCOPE OF THE AIR QUALITY PROGRAM ACTIVITIES AUTHORIZED IN THE DEPARTMENTAL MANUAL

2. MUST BE IN APPROVED RESOURCE MANAGEMENT PLAN

3. MUST PROVIDE DATA AND/OR INFORMATION NEEDED AND USABLE FOR DECISION MAKING

4. MUST BE COST EFFECTIVE

After it is determined that a project meets all of the 4 screening criteria above, the following is used in judging a project's importance and relative priority to other projects.

1. SIGNIFICANT ISSUES AND INFLUENCES RELATED TO RESOURCE PROTECTION

    a) Priority in RMP: low to high

    b) Problem Definition in RMP: general to specific (e.g., General: characterize air quality conditions of park; and Specific: determine sensitivity of Sequoia seedlings to SO_2)

    c) Relationship of resource to national significance of area/legislative or management purpose: low to high

    d) Significance of resource to visitor experience: low to high

    e) Protection mandated by explicit statutory or regulatory requirement: (e.g., endangered species, class I status under CAA, visibility, cultural, historic resources)

    f) The magnitude/severity of damage: no damage to rapid or irreversible damage

    g) Immediacy of concern: existing damage
       imminent damage
       potential damage

    h) affects visitor/employee health, welfare, and safety

2. HOW AND TO WHAT EXTENT DOES THIS PROJECT PROVIDE DECISION-MAKERS WITH INFORMATION IMPORTANT FOR MAKING DECISIONS ON CRITICAL ISSUES?

    a) Immediacy/urgency of decision making schedule:

       0-6 months
       6 months - 1 year
       1 year - 2 years
       2 years - 3 years

    b) Will information be available in time?

       yes?
       no?

    c) Will information address recurring decisions?

       yes?
       no?

    d) Will information be applicable for:

       one park
       more than one park
       whole region
       multiple regions
       nationally

e) Impetus for Management Decision

    1. Court Order
    2. Explicit legislative mandate
    3. Explicit regulatory mandate (other than permit review)
    4. Executive Order
    5. Departmental/NPS Directive
    5. Departmental/NPS Directive
    6. Permit review
    7. EIS

3. HOW WILL INFORMATION BE COST EFFECTIVE AND RESULT IN BENEFITS ACHIEVED BY ADDRESSING THE PROBLEM/ISSUE?

    a) Would be applicable to most parks in a physiographic region and/or solve more than one problem.

    b) Would address both short- and long-term decision needs.

    c) Would leverage funding or stimulate complementary scientific research and cooperative funding by other agencies or research institutions.

    d) Would enhance cooperation within NPS (air, water, energy, mining and mineral, natural science, historic architecture, natural resources, etc.)

    e) Availability of the best researcher/expert.

    f) Would ensure completion of on-going projects and prevent loss of needed information and loss of previous investment dollars and man-power.

    g) Park able to contribute portion of staffing and/or funding committment.

More details regarding allocation of staff and funding may be obtained from the AQD.

In order to carry out its responsibilities, the AQD is organized as follows:

Office of Division Chief - Activities include overall direction, review and coordination of service-wide air resource management program; and support to Director for review and comment on legislation and regulations.

Research Branch - Activities include air pollutant monitoring; visibility monitoring; AQRV research; and development and validation of air quality models.

Policy, Planning and Implementation Branch - Activities include assistance in review of state implementation plans (SIPs) for visibility and Prevention of Significant Deterioration (PSD) provisions, and development of related policy and assistance in review of federal programs and regulations pertaining to air pollution; coordination among individual park managers, reviewing the Statement for Management (SFM), General Management Plan (GMP), and Resource Management Plan (RMP); assistance in the development of interpretive programs on air resource management activities.

Permit Review and Technical Support Branch - activities include review of air quality permit applications for new sources; pollution control technology reviews; assistance and guidance to potential permit applicants for new source permits; technical support for Environmental Impact Statement (EIS) review, Environmental Assessment (EA) development, etc.; and analysis of in-park sources of air pollution.

United States Department of the Interior Role in NPS Air Resource Management.

The Secretary of the Department of the Interior has an important role to play in decisions which are made under the Clean Air Act. The Clean Air Act in Section 302(i) defines "Federal Land Manager" as "the Secretary of the department with authority over such lands," meaning that technically the Secretary has the decision authority on Clean Air Act matters. Procedurally, the Department Manual delegates the authority granted to the Secretary under the Clean Air Act to the Assistant Secretary for Fish and Wildlife and Parks.

The Assistant Secretary has stated that his office will exercise this authority. In particular, he has stated that his office will handle all matters related to EPA visibility regulations, with the NPS offices providing staff support. In addition, the functions of the "Federal official charged with direct responsibility for management of such lands" under Section 165(d)(2) of the Act (new source review provisions) are subject to general policy guidance from the Assistant Secretary's office and to specific review in controversial cases. (Appendix 2 provides details of the delegation of authority.) The AQD can provide guidance in determining when the Assistant Secretary's review is necessary and provide assistance in obtaining the clearance when required.

KEY NPS AIR RESOURCE MANAGEMENT ACTIVITIES

This section provides general information and guidance to assist NPS personnel in understanding more fully their air resource management activities, authorities and responsibilities. The information is presented according to specific air resource management activities undertaken by Service personnel. These activities are listed below. The last six items are related to the Clean Air Act and NPS authorities and programs under the Act.

- Planning
- Research and Monitoring
- Development and Analysis of Regulations
- Environmental Assessments and Environmental Impact Statement
- Development and Review
- Mineral Resource Leasing
- Interpretive Activities

- Clean Air Act Activities: Introduction and Overview
- The State Implementation Plan
- The New Source Permitting Process - Prevention of Significant Deterioration
- Air Quality Modeling
- Remedying Existing Pollution Impacts
- The Redesignation Process

PLANNING

National Park Service personnel can help implement the air resource management mission by participating in the planning processes of both NPS and other government entities. In addition NPS personnel can assist in implementing air resource management projects specified during the planning processes. This section first discusses the specific aspects of the NPS internal planning process which provide an opportunity for incorporating air resource management goals, objectives, issues and projects. The second portion of this section highlights areas of other agencies' resource management planning and implementation activities where NPS personnel should participate for the purpose of protecting the park resources and ensuring visitor enjoyment.

NPS Internal Planning

The NPS internal planning process provides opportunities for NPS personnel to carry out the air resource management mission. It is important to include air resource management objectives and projects in NPS planning documents in order to ensure that projects to protect the park resources and enhance visitor enjoyment are funded and implemented. In many cases, it is the responsibility of the park staff to ensure that air resource management is adequately addressed in NPS planning documents. Park staff also have a role in implementing the air resource management projects. A discussion of those planning documents that are most relevant to the air resource management planning process follows.

It also describes NPS organizational responsibilities for implementing air resource related projects contained in the management plans.

Statements for Management. The first opportunity to address air resource management issues arises during the preparation of a park's Statements for Management (SFM). The SFM identifies issues, problems, and management objectives related to the park. It is prepared by the park superintendent and park staff and reviewed and approved by the regional director. It is updated every two years to assure that it reflects a current view of the park in its regional context.

There are several sections of the SFM within which air resource management objectives can be addressed either during the development of the SFM or through the review and revision process which occurs every two years. Air resource related matters may be included in the following sections:

> "Inventory and analysis of influences" - This section contains an inventory of park resources, thus providing an opportunity for park staff to (1) identify resources or values that have been and still are considered crucial to the value of that unit within the National Park system; and (2) to describe the major influences on these resources. For example, resources which are sensitive to air pollution, such as visual resources would be included in this section of the SFM with a description of the kinds of impacts that may occur from air pollution.
>
> "Land uses and trends" - This section of the SFM is an appropriate place to discuss uses of land in or near the park that may impact air quality in the park and affect park resources.
>
> "Major issues" - This section presents an opportunity to highlight air quality related problems that arise, for example, as a result of the land uses and trends discussed in the previous section. Park staff may also be able to identify other major air quality related issues by examining possible air pollution effects on key resources listed in the section which includes the resource inventory and analysis.
>
> "Management objectives" - This section provides the opportunity for park staff to include broad air resource management goals for future planning and management of the park. The objectives are stated as a list of desired conditions. For example, one objective might be "to identify, evaluate, protect and preserve the park's air quality related values in accordance with legislative and executive requirements." More specific sub-objectives may also be included such as "to achieve a reduction in SO_2 which is causing damage to conifer populations in the park."
>
> Park staff may need additional information or technical assistance in preparing the air quality portion of the SFM. The AQD and regional staff are able to provide such assistance.

The Statement for Management forms the base from which other planning documents are developed. The other planning documents reflect the purposes, management influences and objectives indicated in the SFM.

Thus, addressing air quality related problems, issues and objectives in the SFM is an important first step in planning for the protection of AQRVs in the parks.

General Management Plan/Environmental Document. The major planning document for all parks is the combination General Management Plan/Environmental Document (GMP). This document provides parkwide strategies for resolving issues and meeting the management objectives of the park over a 10-15 year period. The strategies outlined in the GMP address the management of park resources and provide for visitor use and appreciation of the resources. Assessments of the environmental impacts of the projects set forth in the GMP are also included in the document. The GMP is developed by an interdisciplinary team composed of park and regional personnel, personnel from the Denver Service Center, and the appropriate Washington level office. After a review by the public and other agencies, and after the preparation of any necessary environmental assessments of GMP projects and revisions as necessary, it is approved by the regional director.

In general, the GMP does not address air quality related strategies in detail. Air quality issues and problems, monitoring recommendations, and research needs are addressed in detail in action plans such as Resources Management Plans, Land Protection Plans, and Fire Management Plans. The major emphasis of air quality needs and issues should be in the Resources Management Plan project statements. (The Resources Management Plans are discussed in further detail below.)

A GMP does, however, address broad resource strategies in a section entitled "Resource Management." It may generally set forth actions to monitor, inventory, study, restore, interpret and otherwise perpetuate the park's natural resources. To the extent that a GMP broadly documents whether or not air quality influences on the park's resources exist, it sets the stage for the development of specific strategies to deal with such influences for inclusion in the RMP.

In the development of the air quality related portions of a GMP, technical support may be available from the AQD and the regional staff. For example, in some cases, the AQD can provide assistance to those involved in the preparation of the resource management section of the GMP by helping to define the park's and the region's current air quality through the use of modeling and monitoring of the surrounding airshed. In addition, park staff may wish to consult with the AQD during the environmental assessment of such GMP activities as road and building construction, other development projects, and prescribed burns.

Once specific projects are established in the GMP, park staff may have the opportunity to implement or assist in implementing certain projects so that they have minimal impact on air quality and AQRVs. For example, park staff may be able to implement a fire management program specified in the GMP in a manner which ensures that open burning is performed when conditions are optimal for visibility protection and enhancement. Park staff may also engage in activities to prevent harmful impacts on air quality from park development projects specified in the GMP (e.g., construction of visitor facilities, buildings, roads, and the construction and operation of utility systems). For example, measures might be taken to wet down roads during construction to minimize windblown dust. In addition, park personnel may be able to design or modify automobile routes and parking areas in the park so as to minimize potential air pollution impacts on park resources.

The AQD is available to assist park staff in assessing the potential impacts of various park projects on the park's air quality and AQRVs and to help design measures to prevent or mitigate the air pollution impacts.

Resources Management Plan. As mentioned above, the Resources Management Plan (RMP) is the planning document in which air resource management issues can be addressed in detail. It contains strategies designed to resolve issues and problems related to the park's natural resources as well as science/research programs needed to more accurately define crucial aspects of such problems. Each resource issue or problem is addressed in a separate project statement. The project statement includes a description of the issue or problem, alternative actions to address the problem and their probable impacts, and a recommended course of action. For example, projects may address problems arising due to pollution impacts on park resources such as flora, fauna, and visibility. RMP projects also include plans for monitoring or for air quality related research.

Air resource related components of the RMP are prepared primarily by the park staff, in consultation with the AQD and regional staff. It is important that park staff document air related problems and research needs in the RMP in order that necessary projects be funded. The park staff should prepare funding requests (10-238s) for projects contained in the RMP and those additional projects that may arise throughout the year. These requests should then be submitted to the regional staff for overall ranking with other air quality projects proposed for that region. The regional office forwards the ranked list to the AQD for consideration of funding. The AQD may provide funds for park visibility, pollutant, and biological effects monitoring (including purchase of equipment) and for short-term activities related to permit review (e.g., inventorying sensitive park resources and identifying the susceptibility of these resources to predicted levels of air pollution). The AQD may also provide funds for quality assurance programs and the hiring of consultants and field personnel for implementing special activities, projects or programs.

Regional and AQD staff are often available to provide technical assistance to park staff during the development of air quality related projects for the RMP. For instance, they can assist with the identification and analysis of the air pollution impacts on park resources and help with the development of alternative solutions and recommended courses of action. The AQD may be particularly helpful in developing plans to pursue research activities related to the park's air quality related problems. (For further information on the AQD's criteria for ranking and allocating its staff and funding resources to air related projects see NPS ORGANIZATIONAL UNITS RESPONSIBILITIES, pg. 33).

In summary, the process of developing the RMP provides an important opportunity for park, regional and AQD staff to work together to incorporate into the planning process those projects which can prevent or remedy the impacts of air pollution on the park's resources.

The responsibility for implementing the projects set forth in the RMP falls primarily to the park staff. However, with respect to air quality projects, regional staff have a role in assuring that the projects are faithfully implemented. For example, regional staff play a key role in coordinating the parks' air resource monitoring programs. In addition, AQD staff are available to assist park staff in the implementation of air quality projects contained in the RMP.

At the park level, implementation of RMP projects may include:

- developing an inventory on the area's AQRVs;

- examining flora, fauna, waters, etc., to determine which resources may be particularly sensitive to air pollution from existing or future sources locating in or near the park;

- monitoring for any trends in damage to park resources;

- monitoring of visibility degradation;

- air pollutant monitoring; and

- implementing various other projects designed to prevent, mitigate or remedy the effects of air pollution on the scenic vistas and other park resources.

The AQD may be able to assist park staff with the following RMP projects: (1) identifying sensitive park resources and becoming familiar with signs of air pollution damage; (2) documenting air quality related effects on park resources, noting any trends and identifying potential sources; and (3) implementing air quality and visibility monitoring programs in the park. In addition, the AQD staff are available to help evaluate the effectiveness of the various projects which are undertaken to prevent or mitigate the effects of air pollution on park AQRVs. Moreover, the AQD staff have technical expertise to design and carry out research projects to address the park's air quality related problems. Thus, depending on available staff and funding resources, the AQD may be of significant assistance to park personnel for RMP projects.

Outline of park requirements and 10-238s. Another step in the planning process is an analysis of the plans and tasks that must be performed to resolve issues and achieve objectives. Park and regional staff contribute to this task analysis during the preparation of the Outline of Park Requirements (OPR) and its related development/study package proposals (10-238s). The OPR lists in priority order all planning, design, and study tasks required to deal with issues and problems affecting the parks for a five-year period. A 10-238 is prepared for each task to request programming and funding for the tasks during the next five years and to provide details of, and justification for, the task.

During this part of the planning process, park staff have the opportunity to include tasks which are necessary to address air quality related problems in the parks. In some cases, an air quality related problem may be suspected but the solution cannot be specified until the actual accomplishment of studies and on-site evaluations of the problem. In these situations, a form 10-238 should request a special study to evaluate the extent of the problem and identify possible solutions. When the investigative study is completed, another 10-238 can be prepared in order to accomplish the solution.

Regional staff and AQD staff can provide support during the development of the OPR. Furthermore, the OPR and 10-238s are submitted to the regional air quality coordinator, who ranks proposed air resource related projects during the formulation of Service-wide planning, design and study programs. New and updated OPR's and 10-238s are due in the regional office by March of each year. It should be emphasized that if, at any time, park staff identify additional air resource planning or study needs, or air quality related projects that require funding, new 10-238s should be prepared for the proposed tasks and submitted to the regional office. Regionally approved and ranked 10-238s are submitted as a package to the AQD. The AQD and assigned regional contacts/coordinators participate in an annual Servicewide priority-setting meeting to rank all air submissions. Subsequent projects are funded out of the Servicewide Air Project Account bases.

Assistance to Other Federal, State and Local Agencies in Resource Management Planning

Resource management planning activities are carried out by a variety of federal, state and local agencies as they are within the National Park Service. Many of these activities potentially affect the park staff's ability to manage the air resource for the protection of AQRVs within the park. Several examples are discussed below.

Land use planning. The U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) each have planning programs for integrating resource development and resource protection activities within their jurisdictions. These programs address a broad range of multiple-use resource considerations ranging from timber and range management to wilderness preservation and wildlife protection. To the extent that NPS lands are near USFS or BLM lands, these resource management planning programs may have direct or indirect impacts on the air and other resources within NPS parks. In such cases, park staff may be able to identify in the planning stages those key adjacent lands under other agencies' jurisdictions whose management practices may have impacts on the parks. Once this is done, NPS staff have an opportunity to begin the process for NPS involvement in these important planning activities. Specifically, the park level and regional staff can work to establish informal communication and coordination with the appropriate offices of the other agencies during their resource development and protection planning process. Such coordinated governmental planning efforts could ensure that federal agencies do not engage in activities with potential harmful impacts on NPS resources. NPS assistance to other agencies can also assure that these agencies do not develop contradictory land use practices.

Mineral leasing. Another governmental activity which influences the Service's ability to manage air resources within park boundaries is mineral leasing adjacent to or within NPS lands. (Mineral development within NPS units is limited to those units that have a statement in their enabling legislation permitting such development.) The BLM manages the federal program governing leasing of coal, oil and gas, oil shale, tar sands and hardrock minerals on federal lands. NPS staff should coordinate with BLM staff during the planning of mineral leasing in or near parks. Because this is a very important activity in terms of its potential impact on park resources, mineral leasing is the topic of a separate section in this document (See MINERALS RESOURCE LEASING, pg. 57).

Rights-of-way activities. It is important for NPS staff to become involved in the planning of rights-of-way projects (e.g., highway construction) of federal, state and local agencies that affect air quality near parks. NPS staff should become involved in the pre-design or design phase of the project. At this early point, NPS staff may be able to offer assistance to the federal, state or local governments in evaluating the project's possible effects on air quality and AQRVs in park areas. Local and regional Service personnel may be able to identify potential problem areas and, with the aid of the AQD, could: (1) project the magnitude and type of damage which could occur; (2) present alternative options for accomplishing the purposes of the project with fewer harmful air quality impacts on park resources; and (3) offer recommendations as to the means available to prevent negative park air resource impacts of the activity in question. For example, if a local or state government were considering or evaluating proposals to build a new highway, port or airport near a park area, information would be needed on the environmental (including air quality) impacts involved. Such information (along with suggested design alternatives, wherever feasible, to help avoid air quality damage) could be extremely useful to the governmental authority(s) prior to its final zoning and other approvals.

RESEARCH AND MONITORING

The National Park Service Organic Act of 1916 charges the Service with the responsibility of preserving the unique natural, cultural and historical resources of certain special designated areas, i.e., NPS units, for the benefit and enjoyment of the American people. Inherent in this responsibility are the tasks of determining what park resources are or may be threatened with serious damage, learning details about the nature of those effects, and determining how visitors' experiences of these special areas are or may be at risk. In general, there is a lack of information in these areas related to air pollution. Most air pollution research work has centered on effects on public health and effects on crops and timber. Consequently, little is known about the effects of air pollution on the unique natural, cultural and historical resources of our national parks. Since most regulatory and administrative processes of other agencies rely on air pollution effects data, the NPS must collect, analyze and utilze such data to effectively preserve and protect park resources from air pollution damage. In the case of air pollution, as well as any other agent which is damaging or potentially effecting the parks, the more information that can be collected and analyzed by the Service, the more effective steps can be taken to prevent or mitigate serious damage.

For these reasons, the NPS has established research and monitoring programs which are designed to: (1) assess the conditions of air quality and of park resources sensitive to air pollution; (2) assess the impact(s) of air pollution on park resources and the visitor's experience of those resources; and (3) determine the causes of existing air quality related effects and identify remedial actions to mitigate the effects. These closely related programs, which are headed by the AQD, are discussed below.

Research Activities

The NPS research program involves a variety of activities designed to provide effective tools, methods and data needed by decisionmakers to recognize and respond to air quality problems in the parks. The major elements of the program include the following:

Effects on Natural Resources. The following measures help assess the effects of air pollution on natural resources:

- Determination of which resources are sensitive to air pollutants.

- Determination of existing air quality.

- Quantification of resource sensitivities to air pollution.

- Determination of present and projected effects of air pollution on sensitive resources.

- Determination of significance of air pollution effects on sensitive resources.

Visibility. The following information helps identify the effects of air pollution on visibility:

- Development and evaluation of visibility monitoring methods.
- Quantification of the relationship between air pollutant emission sources and visual air quality.
- Quantification of the cause-effect relationship between air pollutants and visibility degradation.
- Quantification of visitor perceptions of changes in visual air quality.

Visual Values. The following research helps identify the value and importance of visibility:

- Establishment of the value(s) placed by the visitor on perceived changes in the visual resource.
- Establishment of the relationship which exists between visitor values and visitor enjoyment.

Predictive Air Quality Modeling. The following measures help predict air pollution effects on the air resource:

- Development and validation of methods for predicting ambient air pollutant levels resulting from proposed new sources.
- Determination of existing air quality.
- Development of methods for assessing impacts on visibility and regional air quality from single or multiple sources.

Another important aspect of the NPS research program is monitoring, i.e., the systematic gathering of air quality, meteorological and other relevant resource data. These data ultimately enable prediction of trends in air quality, identification of air pollution sources, and evaluation of air pollution impacts on sensitive park resources. The continuous and careful monitoring of air pollutants, visibility and other air quality related values in the parks provides essential information which supports not only the rest of the NPS research effort but also the other regulatory and policy elements of the Service's air resource management work. The section below describes more fully the NPS range of monitoring activities.

Monitoring Activities

The general term "monitoring" can be used to describe the gathering of information about the status and/or changing condition of a given item. For NPS personnel, therefore, monitoring of the air resource may involve a variety of activities designed to assess the status of the air resource in the parks and to keep abreast of any changes in conditions of the resource or of air quality related values in NPS units. Monitoring is a critical and fundamental part of any air resource management plan or program. Furthermore, it is one of the most important air resource management activities which can be undertaken largely by trained on-site park level personnel with assistance from the technical expertise available in the Air Quality Division.

A strong monitoring program in the parks offers many important benefits:

- It provides the basis for an early warning system to aid the Service in anticipating pollution problems and intervening before serious damage can occur.

- It provides a crucial basis for evaluating the efficacy of mitigation actions employed to protect visibility and other AQRVs.

- It allows a historical record to be developed on the condition of the resource over time, so that trends can be observed and projections can be made.

- It provides a useful tool for examining links between effects on air related resources and certain types, quantities, rates, and locations of pollutant emissions.

- It provides the necessary basis for NPS personnel to make informed and effective policy decisions on air resource management issues.

NPS monitoring activities generally fall into the following categories: visibility monitoring, "criteria" pollutant monitoring, and AQRV monitoring. Each of these is discussed below.

Visibility monitoring. The National Park Service is charged with assuring that the visual resource within the national parks is preserved for the enjoyment of today's visitors and those of generations to come. This means that the NPS must be aware of the important vistas and scenic resources located within NPS units and of how those vistas may be detrimentally affected by various levels of air pollutant emissions from sources in or near the parks.

Research on the effects of specific types and levels of air pollution on visibility has become increasingly sophisticated and conclusive in recent years. For example, it has been determined that fine particle pollutants such as sulfate and nitrate are major contributors to the problem of visibility degradation in the parks in the United States. More specifically, sulfate pollution in the eastern United States has been found to be the cause of serious visibility impairment, particularly in the summer months.

These and other discoveries about the impacts of air pollution on visual range and acuity have been made possible largely as a result of the analysis of monitoring studies (See Figure 9). Such studies often consist of some kind of air pollutant identification sampling component and visibility measurements of a particular vista over time.

Visibility monitoring aids not only in research to better understand the phenomenon of visibility degradation in the parks, but also in implementation of the NPS visibility protection mandate under the Clean Air Act. (See sections on CLEAN AIR ACT ACTIVITIES, pg. 60, and REMEDYING EXISTING POLLUTION IMPACTS, pg. 75, for a discussion of this mandate.) With the provision of monitoring equipment and technical assistance from the AQD, NPS staff can exercise their visibility protection responsibilities by: (1) determining the baseline condition of visibility in a given park; (2) determining when visibility impairment occurs; (3) identifying trends in the condition of the visual resource in relation to air pollutant emissions from various nearby sources; and (4) ultimately applying this information to decisionmaking on whether proposed developments in or near the park will harm visibility in the area. In view of the National Park Service's affirmative responsibility to protect the visual resource within its units, the park level staff's ability to assist in the monitoring of visibility may significantly affect the ultimate success of NPS efforts to effectively manage and preserve that resource.

"Criteria" pollutant monitoring. "Criteria" pollutants are those pollutants for which national ambient standards have been set in accordance with the Clean Air Act. (See CLEAN AIR ACT ACTIVITIES, pg. 60, for further discussion of national ambient air quality standards.) The criteria pollutant monitoring program within the park is designed to accomplish several major purposes:

- To assure that the national standards and special pollution requirements for the parks (which are given extra protection under the law) are being met.

- To provide useful information for evaluating the potential effects on ambient pollutant levels of emission sources proposed for location near the parks.

- To help determine how other factors (such as wind patterns, precipitation, temperature conditions, etc.) may affect ambient levels of pollutants in the parks.

- To allow NPS personnel to confirm that park activities subject to state or local permits (such as prescribed burns) meet their permit conditions.

- To provide the basis for assessing the impacts of various pollutant levels on air quality related values in NPS units.

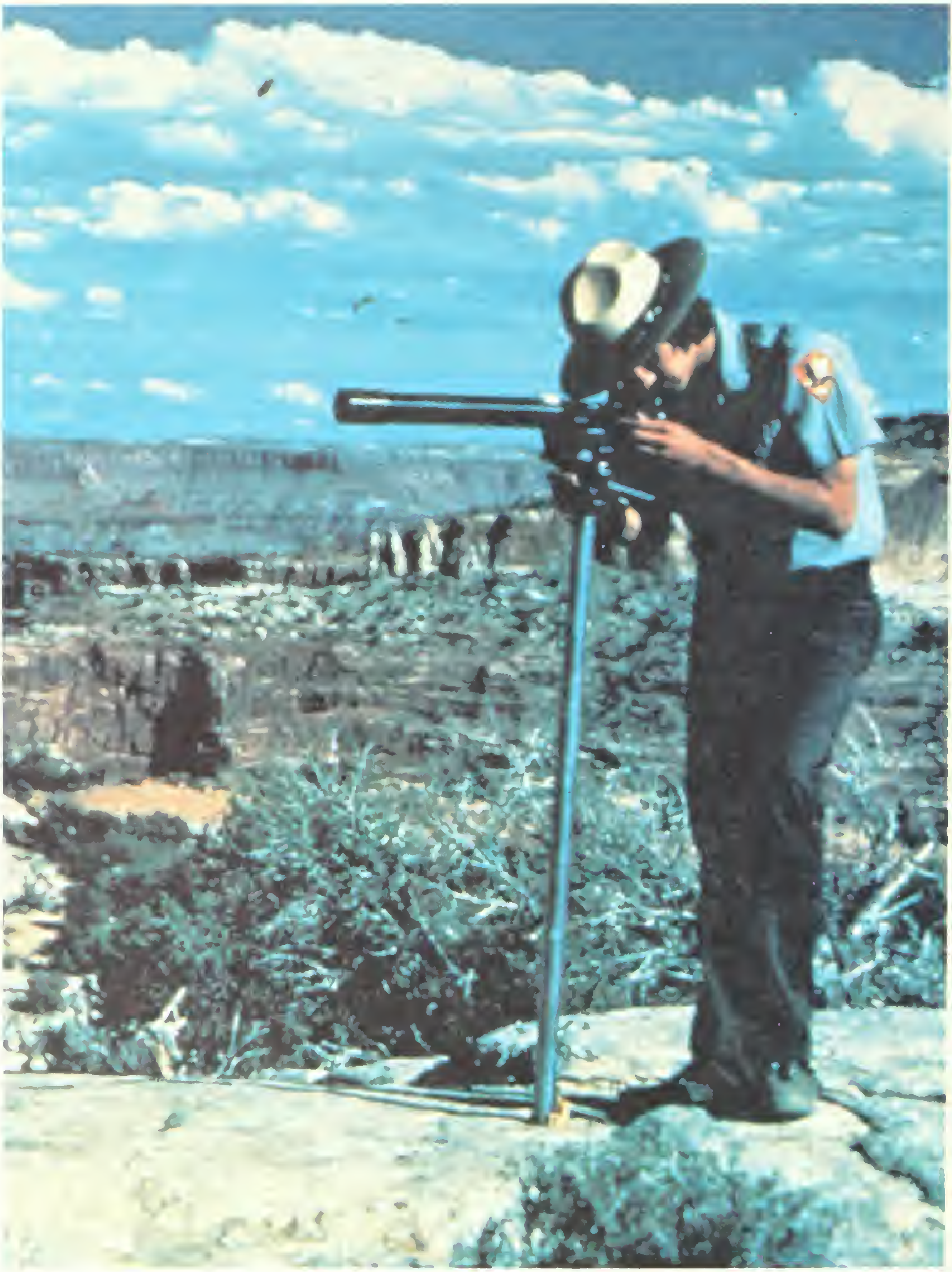


Figure 9. A teleradiometer is used to make visibility measurements at Canyonlands National Park (NPS photograph).

The NPS Air Quality Division is often available to provide technical assistance and/or equipment to park personnel in designing and implementing criteria pollutant monitoring projects.

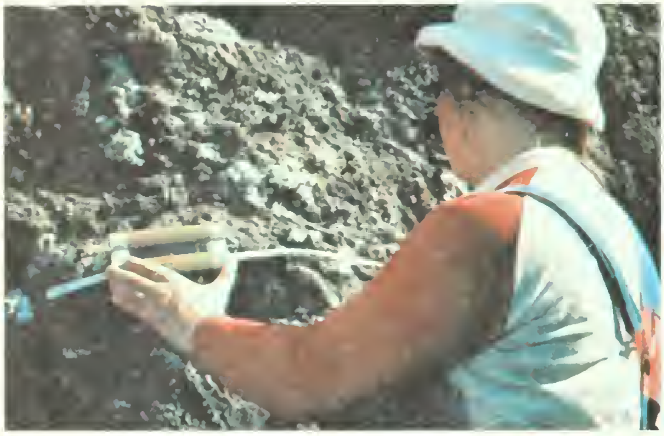
Air quality related values monitoring. Another important area of NPS monitoring in which park level personnel have an important role is monitoring of those values within the park which are affected by and/or dependent on good air quality: the so called air quality related values. (For a definition of AQRVs, see p. 4.) Monitoring of AQRVs often involves a combination of several activities including visual examination, field collection, photography, and data collection on highly sensitive or "indicator" species; air, water, or soil sampling; and other means for gathering information on both baseline conditions and changes or trends in conditions of AQRVs as a result of pollutant emissions (See Figure 10).

Monitoring of AQRVs is an important tool for assessing the effects of existing or planned developments on protected park resources. For example, collection of samples from vegetation, air, water, construction materials, etc. which show existing or impending damage to those resources from current sources would provide an informed basis for subsequent NPS intervention against permitting of additional pollutant sources in the area. Similarly, AQRV monitoring is a useful tool for examining and proving hypotheses about causes and effects of air pollution. Documenting growing sulfur pollution damage to park vegetation in an area near a newly operating sulfur emission source, for example, could provide an effective basis for an NPS policy position that levels of sulfur emissions near a park should be reduced because present levels cause harm to important values within that park. (Cases such as this example point to the need for each unit to have good baseline data from monitoring studies so that incremental impacts on AQRVs can be seen and responded to before damage is so extensive that mitigation efforts may not be successful.)

The NPS air pollution research and monitoring programs are designed both to respond to present problems and to allow the anticipation and avoidance of problems which appear likely or possible. The major purpose of these programs is to foresee and to meet the growing and changing information needs of the parks across the country. Working together in the Service's research and monitoring efforts, the AQD and park personnel can obtain useful information on day-to-day park issues and problems and assure that the programs generate the kind of assistance which will directly aid park staff in performance of their resource management duties.

DEVELOPMENT AND ANALYSIS OF REGULATIONS

The National Park Service's ability to effectively manage the air resource depends, to an important extent, on its success in maintaining an awareness of, and involvement in, other agencies' activities which may result in air quality impacts. There are any number of federal, state and local governing bodies and administrative agencies whose



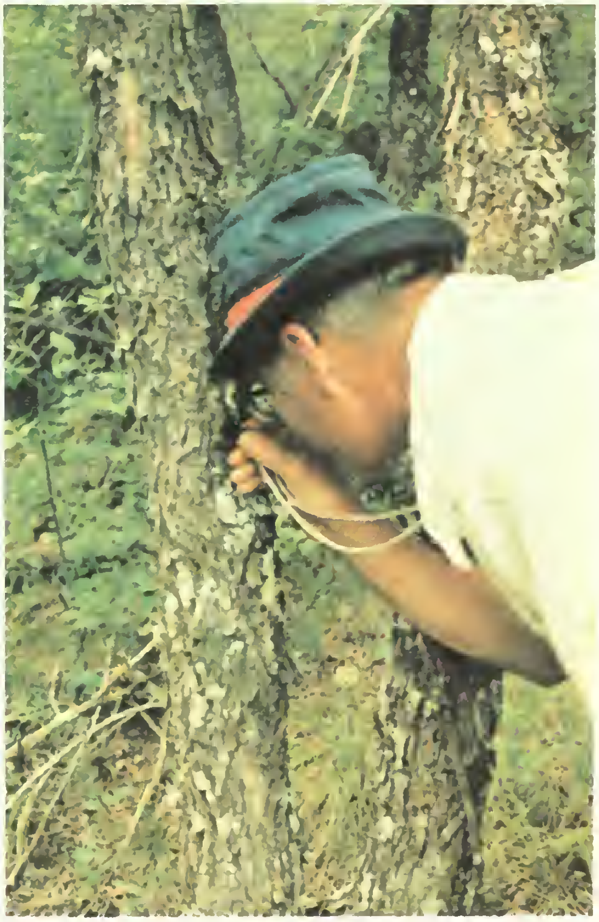


Figure 10. Some species of lichen are very sensitive to sulfur dioxide and therefore are used as bio-indicator species to detect the presence of air pollution (NPS photographs).

regulations may have positive or negative, direct or indirect impacts on park units' air quality and air quality related values. Thus, park personnel have an affirmative responsibility, as air resource managers, to become involved as much as possible in planning, development, and analysis of regulations which may have such impacts on park air quality.

National Park Service personnel may find themselves in a position to provide regulatory support and assistance to a diversity of government programs which may have air quality related impacts. For example, EPA or another federal agency might be developing regulations governing certain types of grants or other assistance to the states for needed public projects (such as highways or sewage treatment facilities) which could result in air pollution damage to park resources if not properly designed and constructed. Or, at the state level, an agency might be developing a set of regulations governing various types of resource recovery or other waste disposal facilities under the federal Resource Conservation and Recovery Act. If the regulating agency is not made aware of important NPS air quality considerations, decisions with respect to the regulations ultimately might lead to damaging effects on air quality or other AQRVs in NPS units in the vicinity. Another state activity, the issuance of permits governing mineral development, is an area where NPS concerns about potential air quality degradation by nearby mining, processing and refining facilities could be voiced and directed to influence the imposition of adequate control and mitigation requirements.

Certainly state, county, and local activities related to the direct regulation of air pollution sources such as power plants, cement plants, chemical process plants, oil refineries, etc., may be influenced by NPS concerns about protection of park resources. For example, NPS became involved with the state and county air quality agencies, after finding out about a proposal to change the pollution emission limits applicable to certain existing power plants within proximity to Everglades National Park (EVER). The power company initiated the proposal and was pursuing a relaxation of air pollution rules which would have resulted in significant increases of sulfur dioxide in EVER. After review and analysis of the proposal bv AQD, the NPS participated in discussions with state and local officials and power company representatives about possible impacts on EVER and attended public hearings to present statements concerning the potential effects the additional emissions might have on park resources. As a result of NPS concern, participation in regulatory proceedings, and recommendations regarding the proposal, no changes were made to any state or local air pollution regulations which would allow the increase. Also, research projects were started with the cooperation and support of the power company to assess the sensitivity of specific air quality related values in EVER, and air quality monitoring was established within the park with assistance from the local air quality agency.

At the local level, county or municipal authorities are generally involved in a variety of regulatory programs which might have impacts on the air resource in NPS units. For example, local governments often are required to consider or develop ordinances to govern activities which involve air pollutant emissions, e.g., refuse burning land development (zoning), or traffic re-routing, etc. Under some circumstances, these activities could result in direct pollution effects on a nearby NPS unit unless preventative action is taken. An illustration of traffic rerouting potentially impacting an NPS unit is the case of Wolf Trap Farm Park near Washington, D.C. In this case, proposals had been developed by state and county officials to open an access road to the park for general traffic use. The AQD performed an analysis to project the impact of such an action on air quality in the park. The AQD analysis arrived at the following projections and conclusions: (a) no adverse air quality impact is likely to occur if new car emission standards are maintained at present levels; (b) if new car emission standards are relaxed (as has been proposed), harmful increases in carbon monoxide levels would result; and (c) mitigation measures are available which could be implemented to help avoid damaging impacts on air quality from the road opening. This analysis has provided an important basis for NPS staff to work with appropriate state and local officials to assure protection of park resources from air pollution increases.

In each of the above examples, opportunities exist for NPS personnel to take an active part in managing the air resource and protecting AQRVs within their jurisdiction. At the federal level, the AQD may work closely with officials of other agencies who are developing or revising regulatory policies which could result in potential impacts on air quality. Also, the Service's regional air quality coordinators may be able to work with regional offices of other federal agencies to assure that NPS concerns and priorities are understood and considered in the development of regulatory proposals. Finally, park level staff may communicate directly with state and local government officials to assure that the sensitivity of park resources to air pollution impacts is well understood and taken into account.

Regarding the regulatory development at the state and local levels, various opportunities exist for NPS personnel to become involved in activities or issues which may affect the air resource in the parks.

Specifically, one way in which regional staff may be able to become involved effectively would be to keep abreast of state regulatory developments and to solicit the assistance, where appropriate, of the AQD or park staff in responding to proposals, testifying at hearings, or performing any other actions necessary to protect the National Park Service's interests. Similar types of opportunities exist at the local government level for NPS staff to pursue means of protecting the park's air resource and related resources.

ENVIRONMENTAL ASSESSMENT AND ENVIRONMENTAL IMPACT STATEMENT DEVELOPMENT AND REVIEW

National Park Service staff involvement in the development and review of environmental assessments and environmental impact statements is necessary for accomplishing the NPS air resource management mission.

As protector of resources in the national parks, the Service is charged with two important responsibilities with respect to environmental assessments and environmental impact statements. NPS must ensure that activities of entities outside of the Service which may impact parks and resources are environmentally acceptable. NPS must also ensure that its own projects and activities are environmentally sound.

It is especially important for NPS staff to participate in the development and review of EISs for other agencies' projects. This enables NPS personnel to take advantage of early opportunities to prevent or lessen a project's negative impact on park air quality and AQRVs. Park level involvement in the EIS development and review process is essential. Using their knowledge of park resources, park staff can point out those resources which may be sensitive to air pollution from new projects, thereby indicating that mitigating measures or alternative means of accomplishing the project's goals may need to be explored. A more detailed description of the EA and EIS development and review processes for both NPS and other governmental entities follows. Opportunities for park staff involvement in the development and review of other agencies' EISs are also discussed.

In accordance with the National Environmental Policy Act (NEPA), federal agencies must analyze the potential environmental effects of all proposed federal projects which may result in harmful impacts on the environment. The EIS must contain an analysis of the environmental impacts of the proposed action and a discussion of alternatives. Also, the EIS must include copies of comments received from federal, state and local agencies and the EIS must be made available to the public.

The National Park Service has issued a set of guidelines (Guideline NPS-12) to assist park personnel in this activity as it relates to Service projects. The Denver Service Center is largely responsible for the preparation of EA's and EISs for NPS. Most of the major actions proposed by NPS that may cause an environmental impact are discussed in the planning documents for a park unit. Thus, compliance with the substantive requirements of NEPA is built into the Service's planning process (see Guideline NPS-2). Other actions proposed outside the Service's planning process that may potentially cause significant environmental impact include: granting rights-of-way, issuance of special use permits, and granting or renewal of concession permits and contracts. (The NPS-12 Guideline contains a list of NPS projects and specifies whether they require an EA.)

For those NPS actions with potential environmental impact, NPS guidelines require that Service staff first prepare an environmental assessment. This is a memorandum report which documents the enviornmental impacts of reasonable alternatives considered during the planning and decisionmaking process. The report is made available for public review and comment and occasionally public workshops are held.

If it is concluded from the EA that the impact from the project is likely to be significant, or that the project is likely to be highly controversial, an EIS is prepared. (The format for an EIS is described in Guideline NPS-12.) Very few NPS actions require the preparation of an EIS. If an EIS is prepared, however, NEPA requires that a public "scoping" meeting be held to obtain public comment and involvement on the problems and issues to be addressed by the EIS.

Other agencies' processes for addressing the NEPA requirements are basically similar to the NPS process described above. As a means of exercising its authorities and responsibilities to protect park resources, the National Park Service staff also takes advantage of opportunities to participate in the environmental impact analyses of other federal agencies' projects. For example, energy and mineral development projects often are proposed for federal lands adjacent to NPS units. Such projects may ultimately have both immediate, direct impacts on air quality, and also indirect or long-term impacts as the projects become fully operational. Park staff and AQD staff are responsible for participating in the development, review of and comment on other agencies' EISs. The perspective of park level employees is important because they are most familiar with the environment at risk. AQD staff may be of assistance because they can provide technical, legal and policy evaluation capabilities on air issues.

In order to be most effective in protecting park resources from the impacts of other federal agencies' projects, park staff and AQD staff need to become involved in project planning and analysis during the early stages. Early involvement allows adequate time for Service personnel to analyze the potential air quality and park resource impacts of the project. NPS staff can then suggest re-direction of problematic aspects of the proposed activity in the early developmental stages of the project. NPS staff can also help identify and analyze other, less harmful alternatives for accomplishing the project goals. Thus, for some projects it is advantageous to begin involvement during the project's pre-planning or design stages, or the request-for-proposal stage.

In subsequent stages of the project, park staff should participate in the EIS development and in scoping meetings in order to express the Service's interests and concerns. Park staff should also prepare written comments for submission to the other agency by the regional office. The AQD is available to assist park staff during their involvement in the EIS development and review process.

During the EIS review process it is especially important for park level staff not only to identify and promote environmentally sound alternatives, but also to recommend mitigating measures for protecting park resources from the impact of a project. An example of a commonly recommended mitigation measure is the wetting down of roads during construction in order to reduce particulate emissions. Such mitigation measures may be incorporated into the other agency's construction or operating plan on the project in question. As such, they are to be observed during the implementation of the project. In order to assure that agreed upon air quality related mitigation measures are observed, such measures should be included in the air quality permit. NPS personnel should, therefore, be actively involved in the permitting process for these projects to ensure inclusion of the mitigating measures. It is also the responsibility of NPS management to seek a referral of the matter to the Council of Environmental Quality if it appears that decisions being made are not consistent with NEPA goals or mandated objectives of the Service.

Thus, the EIS review process provides a variety of opportunities for park staff and AQD staff to meet their responsibility to protect parks from air quality degradation and damage to AQRVs.

MINERAL RESOURCE LEASING

Mineral resource leasing may result in mineral development projects within or adjacent to national parks. Extraction of these mineral resources has the potential to influence the National Park Service's ability to protect park resources and ensure visitor enjoyment. Activities associated with mineral development create air quality problems that affect both sensitive park resources and visibility. It is important, therefore, for park staff to participate in mineral leasing activities in order to ensure consideration of the effects of mineral development on park resources before leases are granted.

The Bureau of Land Management (BLM) manages the federal program governing leasing of coal, oil, gas, oil shale, tar sands and hardrock minerals on federal lands.

The NPS is involved in several aspects of the mineral leasing process and works closely with the BLM in order to keep informed of current and projected leasing developments. Park staff should be in consultation with the NPS Energy, Mining and Minerals Division for technical assistance during the site-specific analyses of tracts near the parks. It is important for park staff to determine the baseline condition of resources which may be impacted by leasing of tracts near parklands. Park staff should also identify sensitive resources or scenic vistas that could be impacted by mineral development on these tracts.

One of the key tools used by BLM for coal leasing is the Regional Coal Team. This team generally encompasses two states. It is comprised of the two state BLM directors, a representative of the governor of each state, and a BLM Washington office representative who chairs the group. The Energy, Mining and Minerals Division is an ex officio member of the coal teams and consults with the parks and regions on coal leasing activities. The team sets the levels of coal which can be mined in the region. The team also reviews tracts of land for their suitability for coal leasing. This review involves site-specific analyses of the tracts using criteria such as sensitive habitats, underground aquifers, and wetlands. In addition, the team develops EISs for those tracts of land which are selected as potential candidates for leasing. After the EIS process is complete, the Secretary of the Interior decides which tracts should be leased.

Park staff should participate throughout the EIS process for mineral leasing, beginning involvement at early scoping stages if possible. This involves supporting those alternatives which specify the leasing of tracts which are not adjacent to parklands. Park staff should also ensure that the analyses of the impact of mineral development activities take into account not only the impact on air quality from the extraction of the mineral, but also the impacts from operation of onsite processing facilities, construction of facilities, construction of roads, increased usage of electrical power, increased traffic, and population growth. For those impacts on park resources other than air and water and for mineral leasing alternatives under consideration, park staff should consult with the Energy, Mining and Minerals Division and ensure that adequate mitigating measures are addressed. For example, measures for reducing the generation of fugitive dust during construction activities should be incorporated in mineral leasing alternatives.

INTERPRETIVE ACTIVITIES

One of the National Park Service's responsibilities is to enhance visitor enjoyment and understanding of park resources through interpretive programs. Interpretation is an educational process which helps establish an awareness of park resources for the enjoyment, appreciation and edification of the public.

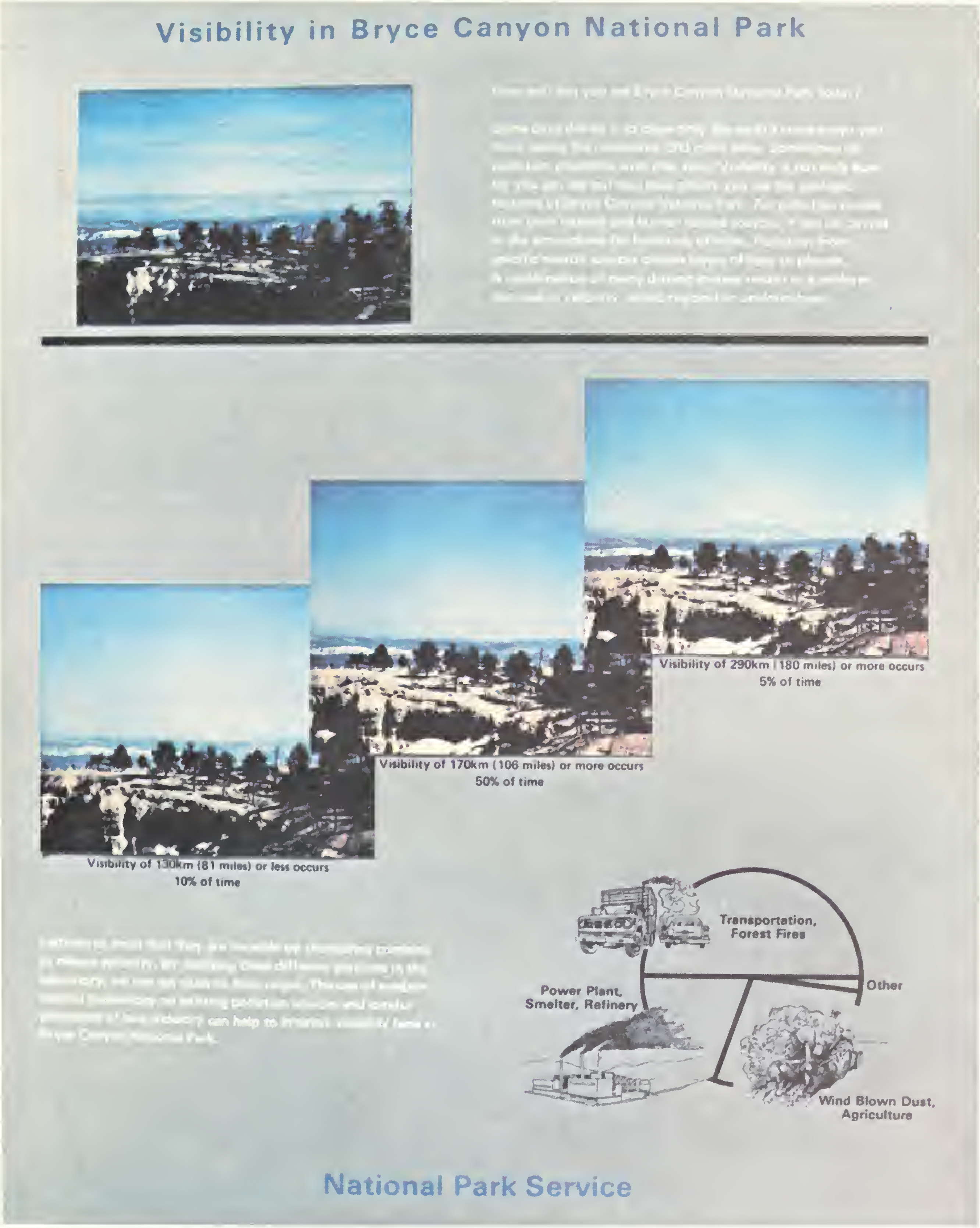
Interpretive programs serve to educate the park visitor about air resource in several ways. First, programs inform the park visitor about air resource management in the parks. Such programs describe air pollution influences on park resources from sources within or near the park and the necessity for park air resource management.

Second, interpretive programs inform the park visitor of the value of the air resource. "Visibility" is explained in the context of the importance of a clean atmosphere to the visitor's enjoyment of the parks' visual resources (See Figure 11). The topic of "sensitive resources" is also covered in interpretive programs. Visitors are informed about the importance of clean air to the park resources (flora and fauna) which are sensitive to certain air pollutants.

Third, interpretive programs describe the park's air quality research and monitoring program. The need for research and baseline data acquisition in order to protect the park resources is explained.

Fourth, interpretive programs inform the park visitor of specific statutory authorities which define the NPS role in preserving air quality. The NPS mandate to protect scenic beauty and resources contained in the NPS Organic Act is described to the visitor. In addition, the authorities to protect air resources included in the Clean Air Act are explained.

Park staff are responsible for preparing those elements of interpretive programs which address the air resource. They prepare photographic and AQRV displays for the visitor center. AQD visibility posters are used for the photographic display. AQRV displays are coordinated with displays on native vegetation.



Visibility in Bryce Canyon National Park

Visibility of 130km (81 miles) or less occurs
10% of time

Visibility of 170km (106 miles) or more occurs
50% of time

Visibility of 290km (180 miles) or more occurs
5% of time

Transportation, Forest Fires
Other
Power Plant, Smelter, Refinery
Wind Blown Dust, Agriculture

National Park Service

Figure 11. Bryce Canyon visibility poster display.

Park staff also prepare interpretive pamphlets for visitor use. Examples of topics included in the pamphlets are:

- The importance of visibility as related to the park's unique resources.
- Air quality effects on park resources (e.g., air pollution effects on sensitive resources).
- What the park visitor can do to help alleviate air pollution in parks during their visits and at home (e.g., conserve energy, use clean energy, carpool/mass transit, etc.).
- What contributes to an air pollution problem in or near the park.

Interpretive talks are other tools that park staff use to inform the visitor about air quality. Park staff, with the support of AQD, prepare slide presentations on visibility and AQRVs. Park staff can also give talks on the information obtained from the research and monitoring programs in the park. The AQD assists park personnel in preparing such talks.

Lastly, park staff set up displays informing visitors about air quality monitoring equipment. Information on the teleradiometer, fine particulate monitor or data summaries can be developed into a variety of interpretive formats.

Samples of pamphlets and other interpretive materials are contained in Appendix 5.

CLEAN AIR ACT ACTIVITIES

Introduction

The Clean Air Act charts the basic mandate and framework for air pollution control in the United States and its territories. As such, it provides direction to federal, state, and local governments as well as to the private sector. It spells out both procedural and substantive requirements to assure protection of air quality and of the other resources that are dependent upon good air quality.

The National Park Service, too, is affected by the requirements and mandates of the Clean Air Act. NPS management activities which may generate air pollution may be subject to state, local and/or EPA regulation. These regulated activities might include use of prescribed fire, construction and operation of a boiler plant within a park, or other activities which may directly or indirectly produce air pollution. In addition, the Clean Air Act also establishes a strong air quality protection program for many national parks, national wilderness areas, and other special natural areas. As a part of this regulatory program, Congress mandated for federal land managers, including the National Park Service, "an affirmative responsibility to protect the air quality related values (including visibility) of any such lands...."

Thus, not only is the NPS subject to regulations under the Clean Air Act, but the Service also has a key role to play in the regulatory process established under the Act which is designed to protect national parks, wildernesses and other areas.

Provided below is a brief overview of the Clean Air Act, with emphasis on the sections which have key relevance to the National Park Service.

An Overview of the Clean Air Act

The Clean Air Act establishes an interlocking set of federal, state and local government responsibilities for air pollution control. Under the Act, the responsibilities of the federal Environmental Protection Agency include establishment of:

National Ambient Air Quality Standards (NAAQS). (Primary NAAQS to protect public health; Secondary NAAQS - to protect public welfare).

New Source Performance Standards (NSPS). (National emission control standards for new power plants, and new factory, energy and industrial processes.)

National Motor Vehicle Emission Control Standards. (National emission control standards for new cars, trucks and buses.)

National Emission Standards for Hazardous Pollutants (NESHAPS). States (or where states have delegated this responsibility, local governments) have primary responsibility for implementing and enforcing federally established air pollution requirements. However, where a state or local agency fails to adequately implement or enforce Clean Air Act requirements, EPA is required by law to step in and carry out those responsibilities. To assist state and local air quality control agencies, EPA provides federal funding to defer a portion of state and local air pollution control costs.

The Clean Air Act requires that each state prepare and implement a State Implementation Plan, or SIP, which serves as the state's regulations on air quality. Each state's SIP contains all the federal air pollution control requirements to be enforced in that state. The SIP must assure the timely attainment and maintenance of all federal air pollution control requirements. These include national ambient air quality standards (and any state ambient standards), national emission control standards (and any such state standards), specific emission limit requirements for individual sources, and a description of the procedural requirements and processes to be followed in that state during the preparation and subsequent revision of the SIP. The public and other federal, state, and local agencies must be given the opportunity to provide input on the proposed requirements to be included in the plan.

After preparing its SIP, each state must submit it to EPA for its review and approval. If EPA disapproves it, the state must revise it and resubmit it to EPA. Once a SIP has been approved by EPA, it becomes enforceable by EPA and by federal court as if it were part of federal law and regulation. Moreover, if at any time the state or local agency fails to adequately enforce the plan, EPA is required to step in and enforce it.

Finally, from time to time, as air quality, technology, or other factors change, a state may be required (or may choose) to revise its SIP. Any such SIP revision also is subject to both public participation requirements and to EPA's review and approval, as described above.

The contents of any state's SIP are tailored to the air pollution problems of that state. The Clean Air Act and EPA's regulations establish separate SIP requirements for areas depending upon their air quality status, i.e., either as a "nonattainment area" or as a "clean air area." In the case of "nonattainment areas," EPA's Nonattainment Requirements apply. For "clean air areas," the Prevention of Significant Deterioration of air quality (PSD) rules are binding.

Nonattainment requirements. A "nonattainment area" is any area which has been classified by EPA as having air quality for one or more pollutants which is worse than the applicable national ambient air quality standards. For each nonattainment area, the SIP must contain measures which will assure attainment of the NAAQS by the applicable deadline. It also must include a comprehensive inventory of all major sources of emissions in the area, requirements for installation and use of "reasonably available control technology" (RACT) by all existing major pollution sources, and a new source permit program that requires that all new major pollution sources achieve the "lowest achievable emission rates" (LAER).

Prevention of Significant Deteriorioration (PSD) requirements. A "clean air area" (also termed a "PSD area" or "attainment area") is any area which has been classified by EPA as having air quality for one or more pollutants which is better than the applicable national ambient air quality standards. In addition, any area which EPA has not classified as either nonattainment or attainment for one or more pollutants is considered a "clean air area" for such pollutant(s).

For each "clean air area" the SIP must contain measures which will assure that no new violations of an NAAQS will occur and that subsequent air quality deterioration does not exceed specified "air quality increments" (allowable increases above present pollution levels) for that area. (For more discussion of air quality increments, see (THE NEW SOURCE PERMITTING PROCESS-PSD section, pg. 66). The plan must include emission limitations for major stationary sources of pollution and a new source permit program applicable to all major new sources. This new source permit program must assure use of "best available control technology" (BACT) on major new sources, that no NAAQS or national hazardous air pollutant standards will be exceeded in the area, that applicable air quality increments for PSD areas are not exceeded, and that all air quality increments for PSD areas are not exceeded, and that all substantive and procedural protections, including both prevention of significant deterioration and visibility protections for national parks and national wilderness areas are honored.

The Prevention of Significant Deterioration requirements are the most important for the purposes of this manual's discussion of the National Park Service's air quality management responsibilities. The remaining subsections below provide greater detail on the most important parts of the PSD requirements from the NPS perspective.

Finally, the Clean Air Act (section 118) specifies that all federal, state and local government properties, facilities, and activities are subject to all federal, state, interstate and local air pollution control requirements. They must comply with these requirements in the same manner and to the same extent as any nongovernmental entity. This means that all federal (including NPS) activities and facilities must comply with all provisions of any state implementation plan, with federal emission control requirements (i.e., NSPS and NESHAPS) and with federal NAAQS.

The above section has provided an overview of the Clean Air Act provisions which relate to the air resource management authorities and responsibilities of the NPS. Subsequent sections of this manual provide more detailed discussions of specific NPS Clean Air Act related activities which are of the greatest significance to the Service's air resource management mission. These activities, listed in the order in which they are discussed, are:

The State Implementation Plan (SIP)

The New Source Permitting Process

Air Quality Modeling

Remedying Existing Pollution Impacts

The Area Redesignation Process

THE STATE IMPLEMENTATION PLAN

Section 110 of the Clean Air Act requires each state to adopt and implement plans for meeting all applicable federal air pollution requirements within their boundaries, including on federal lands. These plans apply to all areas within a state, whether or not those areas already meet the national standards. Furthermore, as national standards are newly issued or are revised by EPA, states must revise their plans to assure that all the federal requirements will be met with respect to these new or revised standards.

The importance of the SIP is two-fold. First, it is a state prepared compendium of the federal clean air requirements to be implemented by that state. If an interested party, including the federal land manager (FLM), wants a particular requirement imposed to protect resources within a park, that requirement must be included in the SIP to provide assurance that the state will act in accordance with the FLM's request. Second, once a requirement is included in a SIP it is considered to have the force of federal law and regulation. It must be implemented by the state (or by EPA, if the state fails to do so) and injunctions can be sought in federal court to require it's implementation. Therefore, if NPS lands are to be protected from air pollution damage, necessary requirements for the protection of visibility or other air quality related values within an NPS-managed area must be included in the SIP.

SIPs generally include the following elements: (1) plans and schedules for meeting the national ambient air quality standards; (2) plans and procedures for meeting all PSD and visibility protection requirements; (3) emission limitations (i.e., regulations) on various types of existing and potential sources regulated by the state and/or the federal government, along with schedules for achieving compliance with those limitations; (4) provision for establishment and operation of systems, procedures, etc., for monitoring and analyzing ambient air quality; (5) provision for enforcement of the federal and state requirements, as necessary; and (6) provision for a permitting process for approving any major new or modified pollution source, including those seeking to locate in or near clean areas such as the national parks.

In general, state air pollution control agencies are primarily responsible for development and subsequent revisions of the SIP. The plan and proposed plan revisions are then subject to public hearings and finally are submitted to EPA for approval. The Agency's approval is based on the SIP's compliance with EPA's promulgated requirements for a satisfactory SIP under the Act. (In the absence of state submission of an approved SIP or SIP revision, EPA is authorized to promulgate regulations for the state.)

One of the most significant pathways for National Park Service involvement in the air quality related regulatory activities of states is through participation in states' SIP development and review processes. NPS personnel are potentially useful not only as reviewers of proposals and plans, but also as providers of the various types of research and analysis needed. For example, assistance to entities such as state and local air pollution control agencies in areas such as criteria pollutant monitoring, visibility and other AQRV monitoring, etc., could help document the actual effectiveness of control strategies designed to protect against air pollution damage to park resources. NPS capabilities in this regard include special expertise on air pollution effects on flora, fauna and other park resources, and particularly on effects of air pollutants on the visual air resource.

There are several ways in which the NPS can usefully be involved with the SIP development and revision process. For example, the law states that in preparing their SIPs and SIP revisions, states must consult with the federal land managers whose lands will be directly affected

[Section 110(a)(2)(J)]. Moreover, the NPS may have an opportunity to file a statement or become otherwise involved in the public hearing generally held by the state at the time of major proposed SIP revisions. In both cases, the National Park Service has an important opportunity to affect the ways in which states control the impact of pollution sources on air or air quality related values in parks. When the state or EPA notifies the NPS of a proposed revision in a State Implementation Plan, the NPS receiving office should notify immediately the appropriate regional air coordinator and the Air Quality Division's technical air quality staff. The technical staff is in a position to review the SIP proposals as to their potential impacts on NPS lands as well as to their legal and regulatory adequacy. Once the technical staff has completed its review and analysis, comments and recommendations are sent back to the regional office for signature and formal submission to the state or to EPA. In some cases, review and approval of the Assistant Secretary for Fish and Wildlife and Parks will be necessary in accordance with his guidance of July 2, 1981, (see Appendix 2).

Another level at which NPS can exert a positive impact on the air quality of its lands through the SIP process is at the federal review and approval level. EPA has the ability, through its SIP review and approval processes, to effect changes in a state's air quality program. By working with EPA, the Service (acting through the regional director and AQD) can do one or more of the following: (1) review and comment on EPA's revisions to its SIP acceptability requirements; (2) review and comment on EPA's proposed approval/disapproval decisions on states' proposed SIP revisions; and (3) review and comment on EPA regulations proposed in place of disapproved state regulations.

In most cases, lead technical responsibility for reviewing proposed state plans and plan revisions rests with AQD, with the final approval and filing of comments with the state or with EPA being the responsibility of the regional director. However, the AQD will not be in a position to provide the regional director with the best technical advice and recommendations without the assistance of the regional and park level staff who are much closer to (and potentially much more familiar with) the potential impact on park resources of the proposed plan. For example, the regional air coordinator, through dealings with the state agency, may be aware of some proposed regulations (destined to be incorporated into the SIP) which would negatively impact the air quality related values in various NPS units throughout the state. Or perhaps staff at the park level might similarly be aware in advance of state plans to grant special variances or deadline extensions to a large emitting source with potentially significant effects on the air quality in that park unit. An example which clearly exemplifies this is the one discussed on page 53, with respect to Everglades National Park. The alertness and quick action by park personnel in this instance, provided the initial step of NPS involvement by recognizing the proposed plan as one which could have significant impacts on the park. By bringing this to the immediate attention of the AQD and by staying involved with the state and local officals, NPS was able to respond to and participate in a process which ultimately led to denial of increases in air pollution from existing power plants near the park. Thus, the need for park personnel to keep abreast of, or ahead of, developments in the state which might result in air impacts in or near an NPS unit cannot be overemphasized as an important air resource management task.

THE NEW SOURCE PERMITTING PROCESS - PREVENTION OF SIGNIFICANT DETERIORATION

In the Clean Air Act Amendments of 1977, Congress spelled out substantive and procedural tools to be used to protect air quality in clean air areas of the country, including national parks, from increased air pollution and air pollution related damage. Specifically, a program was established to prevent any significant deterioration of air quality in clean air regions of the country. The requirements of the so-called "Prevention of Significant Deterioration" (PSD) program are intended, among other purposes, to assure that the future use of the high quality air resource in these areas is carefully planned, managed and protected.

The PSD rules establish a classification system for the clean air areas of the country. These clean air areas may be designated as class I, class II or class III. This classification is not a measure of the present quality of the air in an area. Rather it indicates the additional "increment" of air quality degradation that will be allowed in that area. Thus, a class I area generally is to be subjected to only a very small increment of new pollution and a class II area to a moderate amount, while the class III increments provide for substantial air pollution increases in those areas.

The PSD rules generally are applicable only to major new or expanding facilities seeking to locate or expand operations in clean air areas. The program, therefore, is implemented through the PSD new source review process, a preconstruction review and permitting program for major new or expanding sources of pollution. Of particular relevance to the NPS are those provisions of this program relating to the federal park and wilderness areas which have been set aside for their natural, scenic, recreational or historic values, since these values often are particularly susceptible to air pollution.

As part of the PSD program, Congress designated 158 national parks and national wilderness areas as class I areas, thereby providing those areas with maximum protection from future air quality degradation. All other parts of the country where air quality did not violate national ambient air quality standards were designated as class II, in which only moderate pollution increases are allowed. Most of these class II areas may be further downgraded (but only by states or Indian tribes) to class III, allowing significant pollution increases. At this time, no areas in the country have been designated as class III. Certain areas, such as national monuments, national recreation areas, and many other areas under NPS management, by law may never be designated class III. They may only be designated as class II, or at the option of the state in which they are located, they may be given added air quality protection through upgrading to class I. Of the

National Park Service's 334 units, 48 are class I areas and 53 are class II units which have been protected by law from reclassification to less protective class III status.*

This classification scheme becomes important to understanding NPS responsibilities and authorities within the PSD new source permit review process. Any facility seeking a new source permit for location or expansion in a clean air area has several "standards" or "tests" which it must meet. These standards or tests include, among others, National Ambient Air Quality Standards; Prevention of Significant Deterioration classes I, II, and III air pollution increments; and a special "adverse impact determination" for class I areas-a determination involving an important, legally-defined role for managers of federal class I lands. The following provides an explanation of the relationship among these standards or tests.

In brief, the National Ambient Air Quality Standards, which a proposed facility must not violate under any circumstances, are standards applicable to the entire country. These standards represent those pollution levels acceptable for protecting the public health and public welfare. Attainment and maintenance of these National Ambient Air Quality Standards constitute the fundamental purposes of the Clean Air Act. All areas presently not in compliance with the standards must improve their air quality to meet them, and all areas cleaner than the standards must not deteriorate so as to violate them.

The two remaining "standards" or "tests"--class I, II, and III increments and the "adverse impact determination"--are the primary tools of the Prevention of Significant Deterioration (PSD) provisions.

The class I increments apply to clean air regions of the country containing areas such as national parks and wilderness areas. As mentioned earlier, the Clean Air Act established 158 natural, scenic, or historic areas of special national significance as class I. The class I increments represent the extremely small amount of additional pollution that Congress thought, as a general rule, should be allowed in class I areas. The class I increments also represent the restriction on additional pollution which Congress thought necessary in most cases for protection of the resources in federal class I areas. Typically, therefore, a proposed facility must not violate the class I increment.

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* Under the Clean Air Act, mandatory federal class I areas (which may not be downgraded to class II or class III) include the following areas established prior to August 7, 1977: international parks and national parks in excess of 6,000 acres, national memorial parks greater than 5,000 acres and national wilderness areas exceeding 5,000 acres. Class II areas which cannot be downgraded to class III include any of the following which is larger than 10,000 acres: national monuments, national primitive areas, national preserves, national recreation areas, national lakeshores or seashores and any national park or wilderness area which was established after August 7, 1977.

The "adverse impact determination," however, involving managers of federal class I areas provides the possible exception to the general rule that a proposed facility must not violate the class I increment. The "adverse impact determination" is a site-specific test in which the federal land manager for an area examines whether a proposed facility will, in fact, unacceptably affect the air quality values of a class I area. If the manager of the area determines that a proposed facility will not adversely affect its important resources, then the permitting authority may issue a permit to the facility even though the facility's emissions may cause a violation of the class I increment. In this situation, the facility must nevertheless meet a revised set of class I increments established by the Act. Conversely, if the federal land manager determines and convinces the permitting authority that a proposed facility will adversely affect the class I area even though it will not cause a violation of the class I increment, then the permitting authority may not authorize the facility to commence construction and operation. Thus, the "adverse impact determination" is a critical test for a proposed facility seeking to locate near a class I national park or wilderness area.

To assure that the above conditions and tests are met, Section 165 of the Clean Air Act requires that the "adverse impact determination" be made as a part of the PSD new source permit review process. When a major source wants to expand or when a major new source wishes to locate in a clean air area, regardless of whether it is class I, II, or III, that source must receive a permit from the state. (Where a state permit program has not been established, the permit must be issued by EPA.) The permitting authority examines the plans for the facility, its proposed location, general design, projected air pollution emissions, etc., to determine whether it (along with other emitting sources located in the area) will likely cause either the national ambient standards or the PSD increments to be exceeded. The review of the permit application may require anywhere from three months to a year to complete.

During this review process, the law requires the permitting authority to consult with the federal land manager whenever emissions from a proposed new source may adversely impact a class I area managed by that federal land manager. The law also requires the federal land manager to exercise through the permit review process his "affirmative responsibility" to assure that the emissions from the proposed facility will not adversely affect the special air quality related values of the area in question. This "affirmative responsibility" is to be carried out through the "adverse impact determination" process described above. (The Department of Interior's Procedures for determining adverse impacts under the Clean Air Act are provided in Appendix 4.)

The National Park Service, therefore, becomes involved in the permitting process when a major new or expanded source proposes to build or a regional office is informed of such a proposal by the permitting authority or through the Service's "early warning system."*

After the AQD Permit Review and Technical Support Branch learns that an application has been received, the AQD consults with the superintendent of the unit affected as well as the appropriate NPS regional office. Also at this time, the AQD begins its effort to analyze the potential air pollution effects of the source in question and to determine if any unacceptably adverse impacts on the air quality related values including visibility will likely occur.

The AQD's analysis typically involves evaluation of many complex and controversial issues which must be satisfactorily addressed within limited time periods and strict deadlines. Four key questions must be answered by AQD staff:

- Will the projected air pollutant concentrations exceed the appropriate PSD increment or national ambient air quality standards?

- Will the projected levels of air pollution diminish the national significance of the area?

- Will the projected air pollution levels impair the structure and/or function of valuable resources?

- Will the projected air pollution impair the quality of the visitor experience?

In order to determine the answers to these questions, the AQD attempts to characterize the potential air pollution impacts of the new source by determining the magnitude and frequency of the effects involved, the duration and location of those effects, and the potential for reversibility of the effects. In most cases, many or all of the following activities are undertaken by the AQD staff in order to arrive at its recommendation.

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* Through its "early warning system" (and the information provided to that system by park personnel, regional air quality coordinators and others), the AQD frequently has advance information on the construction plans of major pollution sources well before a PSD permit application actually is filed with EPA or the state. When such an early warning is received, it may prove especially useful if AQD and regional staff consult with both the permitting authority and the proposed source developer. This pre-application consultation frequently can not only lead to assuring the adequate consideration of NPS concerns in the permit application but also to mitigating in advance unforseen air pollution impacts on park resources.

- Review and verification of the data and analysis provided in the proposed new source's permit application on the air pollution characteristics of the proposed facility, the pollution control technology to be employed and whether it is the "best available" as required by law, and the predicted concentration of pollutants in the class I area.
- Review of plant and animal species lists for the potentially affected NPS area to identify sensitive species, dominant species, bioindicator species and rare and endangered species sensitive to the pollutants to be emitted by the proposed source.
- Review of the sensitivity/effects literature for known effects on the above key species at predicted concentrations.
- Review of literature on soil types, historic and cultural artifacts, etc., and the known effects of air pollution at the predicted concentrations.
- Determination of whether there is evidence of existing injury in any species or other air quality related value of the area.
- Analysis and determination as to whether the proposed source will produce a perceptible plume or regional haze resulting in reduction in visual range or other visibility degradation.

Upon completion of the permit review by AQD staff, a technical report is prepared by the AQD. This report indicates whether any unacceptable adverse impact on AQRVs is anticipated as a result of the source's emissions, and, if so, whether mitigating steps might be taken that would allow the facility to be constructed while assuring that AQRVs are adequately protected. Such mitigation measures might include application of more effective pollution controls, use of different production processes, and/or locating the proposed facility at an alternative site.

The next step depends upon whether the proposed source's emissions are predicted to cause the class I increments to be exceeded. If those increments will be exceeded, then the permitting authority (the state or EPA) may not issue a permit to the proposed source unless the federal land manager certifies that the emissions from that source will not cause an adverse impact on the area's air quality related values. If it has been established that the AQRVs will be adversely affected, then the permit must be denied unless a special variance is granted. However, where the FLM certifies that there will be no such adverse impact, the permit may be issued.

Another set of requirements, applies, however, if it is projected that the increments will not be exceeded but the FLM determines that the AQRVs will be adversely affected. Because the law establishes an affirmative responsibility to protect potentially affected AQRVs including visibility, the FLM needs to carefully consider all means of providing the permitting authority information as necessary to demonstrate that a permit should not be granted. If, based upon this demonstration, the permitting authority determines that the AQRVs of the area will suffer unacceptable adverse impacts, the permitting authority may not issue a PSD permit to the facility in question, even though class I increments will not be violated.

As indicated earlier, while the Clean Air Act's mandate to the FLM and to park managers to protect AQRVs applies only to class I areas, the NPS also should participate in PSD reviews of permit applications affecting

NPS areas designated as other than class I. In the case of such an application, upon learning of a proposed facility to be located in or near an NPS class II area, the AQD technical staff will determine whether or not the facility seeking the permit has the potential to adversely affect the resources of the NPS unit. If the proposed source does not have the potential for affecting an NPS class II area and is not projected to cause an exceedance of any class I increments, the technical staff will so notify the regional air quality coordinator and the appropriate NPS unit. On the other hand, if the AQD's analysis indicates that the class II area increment will be exceeded or that area resources will be damaged, this information immediately will be brought to the attention of the Assistant Secretary as well as regional and park staffs. The AQD will prepare a technical report supporting its findings. Since, under the law, class II increments cannot be exceeded (no variance is available as in the case of class I increments), the NPS should consider filing comments with the permitting authority demonstrating the projected class II increment exceedance and pointing out that under these circumstances the permit may not be granted. Similarly, if technical analysis shows that other park resources may be damaged by the air pollution levels projected to result from the proposed facility, this information should be provided to the permitting authority.

There are a number of ways in which NPS personnel can work together in the new source review process for the protection of both class I and class II areas. Park level staff can make an invaluable contribution to the PSD review effort by systematically making themselves aware, as soon as possible, of planned or proposed industrial, energy or mining projects near NPS units. They should then keep the region and AQD informed of such potential development activities. Useful sources of information might be the local news media, meetings with local citizens, discussions with other federal or state land managers, etc. Furthermore, as discussed earlier, park and regional staff may assist the AQD in identifying and inventorying AQRVs of potentially effected areas and in determining whether any of those AQRVs already are experiencing air pollution related or other damage of significance. Such information would ultimately be used by AQD in conducting its analysis as part of the adverse impact determination.

In carrying out the adverse impact determination and in the preparation of its findings, the Air Quality Division frequently may consult park and regional staff who are more familiar with the park in question and its resources. After completion of the adverse impact determination, the AQD coordinates the final compilation of NPS comments on the proposed source's permit application. The Office of the Assistant Secretary for Fish and Wildlife and Parks coordinates the final preparation and submission of the NPS comments on the proposed source's permit application. (As mentioned earlier, information on the Clean Air Act responsibilities of the Office of the Assistant Secretary is provided in Appendix 2.)

AIR QUALITY MODELING

In air resource management, many cases arise where air pollution monitoring data simply are not available when important regulatory or resource protection decisions must be made. For instance, an environmental impact statement on a proposed project must include an assessment of the effects of the proposed source's emissions on the area's air quality and the air quality related resources. The new source permit review process for a proposed plant must determine whether the new source will cause either ambient standards or applicable class I, II, or III increments to be exceeded. Obviously in both of these cases, air quality monitoring data do not exist on facilities that have yet to be built. Similarly, existing resource damage (e.g., leaf discoloration and damage, acidification of streams and lakes, etc.) may be occurring deep within a park. Existing air pollution may be suspected as a cause of this damage, but where no air pollution monitoring equipment has ever been operated near the damage site, no empirical data will exist on the actual pollutants and the levels that have occurred.

In these and other situations where reliable monitoring data do not exist, an air resource manager relies on "air quality modeling." Modeling is a tool which is used, along with ambient air quality monitoring and resource effects monitoring, to project both existing (i.e., baseline) pollution levels and the air pollution levels that are likely to result if a proposed new source of pollution is located in an area. This subsection is intended to introduce NPS park personnel to air quality modeling. It briefly discusses what air quality modeling entails, which pollutants are modeled, the data that are necessary for modeling to be conducted and the accuracy of the air quality projections produced by modeling.

What is Meant by "Air Quality Model"?

An air quality model is the mathematical representation (or "model") of the physical and chemical processes by which air pollutants are emitted into, dispersed, transformed and deposited out of the atmosphere. It attempts to approximate the mixing and progressive dilution of pollutants through the atmosphere in order to project the effect that a source or sources of pollution will have on air quality levels at particular ground points called "receptors."

What Pollutants are Usually Modeled?

The pollutants usually modeled are sulfur dioxide (SO_2) total suspended particulate (TSP), nitrogen dioxide (NO_2), and carbon monoxide (CO).

How is Modeling Conducted?

Modeling may be conducted in a variety of ways. Rather simple "screening" models, often used as preliminary devices to help determine whether more sophisticated modeling is necessary, may require nothing more complex than pencil, paper, and a handheld calculator. More complex modeling, such as that performed in preparing a new source permit application, often entails use of complex computer-assisted calculations.

What Data are Used as Input to the Model?

There are three primary categories of data which are input to the air quality model; meteorological data, emission parameters and pollutant levels.

Meteorological Data. Whenever possible, the analyst attempts to use actual "worst case" meteorological conditions will allow the model to project the highest pollution levels that are likely to occur during any given period in that area. If actual weather data are not available for that area, then historical or assumed worst case weather data will be input. Specific meteorological data used pertain to the following variables for a particular site or a geographically similar location:

- wind direction
- wind speed
- temperature

Emission Parameters. The analyst includes as input data to the model certain characteristics of the particular facility whose air pollution impact is being assessed. These emission parameters include:

- stack height, i.e., height(s) above the ground of the opening of the facility's smokestack(s)--or other points of pollutant release. The stack height affects the dispersion and dilution of the pollutants before it strikes the ground.

- effluent temperature, i.e., the temperature of the emissions flow at the point of release from the stack. The temperature of the exiting emissions helps determine the buoyancy of the gases and the distances they will rise in the atmosphere after they exit the stack. This is important in determining dispersion and dilution of the pollutants.

- pollutant volume flow, i.e., the velocity or exit speed of the pollutant stream as it leaves the stack. The rate of flow of the emission stream also helps to determine the distance it will rise into the atmosphere after it exits the stack.

Pollutant Levels. The analyst includes in the model the following data with respect to existing air pollution levels in the area and the projected emissions from the proposed new facility:

- existing air pollution concentrations in the ambient air in the area of the proposed plant and the area to be studied; and

- new emissions in the area that will result from newly permitted sources currently under development but which have not yet begun operation; and

- assumed emissions from the proposed new facility.

The Clean Air Act [Section 165(a)(6)] also requires, when a new source permit application for a PSD area is being reviewed, that an analysis be performed of any air quality impacts that will result from the growth associated with the proposed facility. As a part of this analysis and at the option of the permitting authority, two types of optional air quality modeling may be required. These relate to assessing the air pollution impacts not only of the proposed facility itself, but also resulting from other facilities and from new population growth which will result in the area because the proposed major facility will locate there. In the event these types of "associated pollutants" are to be modeled, the following will be input data to the model:

- assumed emissions from associated facilities; and

- assumed emissions from population growth (primarily additional emissions resulting from space heating and automobile emissions).

How Accurate are Model Predictions?

Air quality modeling is a still developing science which has undergone considerable increase in sophistication and improvement in accuracy over the last decade. Today, modeling is routinely used for estimating pollution impacts where extensive monitoring data do not exist. Modeling can be expected to undergo continued refinement in the years ahead.

In general, models used as part of the new source permit review process are those which EPA has approved for use. From time to time, however, new models or variations of existing models are developed by a new source proponent and submitted to EPA for case-by-case approval. In cases where models are used in permit applications for new sources which may affect NPS areas, NPS will need to ensure the reasonableness of the model, of its assumptions, and of its output and interpretation. This is necessary whether the model is pre-programmed or newly proposed for EPA's approval. Only then can there be reasonable assurance that the air quality projections produced are the most probable ones.

In assessing the validity and accuracy of the air quality predictions resulting from any modeling exercise, several factors must be taken into account:

- the accuracy of the meteorological, emission and other assumptions input to the model;

- the terrain conditions - if the proposed facility is to be located in very rough terrain, the range of uncertainty surrounding any prediction is greatly increased, since atmospheric dispersion is much more complex and less understood in such terrain;

- the distance from the proposed facility where any predicted air pollution level is projected to occur - the farther a modeled receptor is from the proposed plant, the greater the uncertainty surrounding the projection for that receptor;

- pollutant deposition rates - the rate at which pollutants settle out of the air and are deposited on the ground is a source of scientific uncertainty; if the model assumes a high rate of deposition the projected pollutant levels downwind will be considerably lower than if a lower deposition rate was assumed;

- pollutant chemical transformation - the rate at which certain pollutants are chemically transformed as they move through the atmosphere (e.g., the chemical transformation of sulfur dioxide to particle sulfate) is also a matter of scientific uncertainty; a model which assumes a high rate of conversion of SO_2 to sulfate will predict lower SO_2 levels (but higher sulfate levels) than a model which assumes a lower transformation rate.

REMEDYING EXISTING POLLUTION IMPACTS

Previous sections of this manual have discussed the National Park Service's opportunities and responsibilities to utilize the Clean Air Act's new source permit review program to protect park resources from future air pollution damage. However, those authorities apply only to newly proposed air pollution sources. A separate issue, therefore, relates to what the NPS can do to mitigate air pollution impacts from existing private sources located near park boundaries.

The Service's legislative mandate for protection of resources clearly requires NPS to protect park resources from damage due to air pollution, even if the sources responsible for the pollution are not covered by the Clean Air Act PSD program. If park personnel suspect that existing sources of air pollution are damaging park resources, they should immediately notify AQD technical staff. Then, the AQD staff, working in cooperation with park and regional office personnel, will make a preliminary determination as to whether the suspected resource damage may be air pollution related. Where AQD staff determine that adequate evidence of such a relationship to air pollution exists, they will attempt to quantify and document the problem. Ultimately, these efforts will result in preparation of a report for the regional director and park superintendent. This report, to the extent possible, will document (1) the air pollution damage to park resources; (2) the source(s) responsible for the air pollution; and (3) alternative actions which might be taken to reduce or eliminate damage to the resources being affected.

Once this is accomplished, AQD, regional and park staff have several available courses of action. First, attempts are made to determine whether all sources in the vicinity of the park are complying with all state and federal air pollution control requirements. If any source is not complying, and this is resulting in increased emissions which may be damaging park resources, NPS may wish to consult with the source, or to petition the state or EPA to enforce compliance. (Alternatively, NPS may seek to initiate litigation against the source and/or against the state, asking the court to order compliance.)

Second, where an existing source is complying with all Clean Air Act requirements but its air pollution nevertheless is causing resource damage in the park, regional and AQD staff may consult directly with the offending source. The source will be advised that its emissions have been documented as the cause of damage to important values in the park and that the NPS is requesting a reduction in emissions.

Additionally, the NPS may directly petition the state and/or EPA to require the source to control its emissions to the extent necessary to prevent the documented resource damage. Finally, the NPS (through the Solicitor's Office) can pursue court action, seeking a judicial order for the source to reduce its emissions so as to prevent further resource damage.

In addition to these alternative actions, the Service has another set of tools which can be used in cases where the parks' visual air resource is being impaired by emissions from existing sources. These tools are found in Section 169A of the Clean Air Act, entitled "Visibility Protection for Federal Class I Areas." This section, which applies to any state in which there is located any specially-designated federal class I visibility protection areas, requires EPA and the states to identify visibility impairing sources and the class I areas they affect. Each state then must require any major stationary source of pollution (constructed after August 7, 1962) which is impairing visibility in a specially-designated area to install special air pollution controls. These controls, called "Best Available Retrofit Technology" (BART), would be designed to reduce or eliminate visibility impairing pollutants.

Section 169A mandates FLM involvement in this special visibility protection program. States must revise their SIPs to conform to the law's visibility protection requirements. However, before doing so states first must consult with the appropriate FLMs prior to holding public hearings and proposing revisions of their SIPs. Moreover, if a state proposes to exempt any source from the BART requirements, it may do so only with the concurrence of the appropriate FLM.

There are a variety of actions which the NPS may take where it is suspected that visibility impairment is being caused by emissions from existing sources near a park. For instance, the regional and park staff, in consultation with the AQD, should identify and document for the state any existing visibility impairment. In addition, they could compile and provide to the state information on the various sources of pollution in the region which may be contributing to the visibility impairment. Furthermore, on the basis of the technical analysis and recommendations provided by the Air Quality Division, the regional director and the park superintendent may take any or all of the following actions when a specific case arises:

- prepare and provide to the state and EPA written documentation of existing impairment and its source(s);
- meet with the state to urge action to remedy the documented impairment;
- submit statements and/or present public testimony on visibility impairment at state hearings and meetings on SIP revisions; and
- if the state's SIP fails to adequately address existing visibility impairment in applicable federal class I areas, file objections with the state and with EPA documenting the state's failure.

THE REDESIGNATION PROCESS

As discussed in earlier sections of this paper, the Clean Air Act Amendments of 1977 provide for all areas of the country to be classified as "attainment" or "nonattainment," depending on whether those areas meet the national standards for given air pollutants. Those areas which are classified as attainment are further classified into one of three categories, often called "PSD areas": class I, class II and class III areas. Class I areas are provided the greatest amount of protection under the law and are allowed the least amount of additional degradation from future air pollution sources. Class II areas are allowed somewhat more degradation, and class III areas may receive the highest amounts of additional degradation. However, in no case can pollutant levels in attainment or PSD areas exceed the National Ambient Air Quality Standards. It should be noted that currently all attainment areas of the country are designated as either class I or class II; no PSD areas are currently designated as class III.

In establishing the Clean Air Act, Congress acknowledged that there might be times when a state (or Indian tribe) may want to redesignate PSD areas to provide greater or lesser protection from air pollution degradation. It is important for NPS managers to understand the conditions under which redesignation of lands is permitted, because redesignation will affect the level of protection which a unit is afforded from air pollution degradation. It is in the National Park Service's interest to encourage action which will provide added air quality protection under the law wherever necessary and feasible, and conversely, to intervene in proposed redesignation which would allow greater air quality degradation.

The Act provides very specific direction on the types of redesignation actions which can be taken, and by whom. Section 164 provides that only states (or Indian tribes) can redesignate PSD areas. The Act further establishes four overall guidelines on designation of areas:

- International parks, national wilderness areas which exceed 5000 acres in size, national memorial parks which exceed 5000 acres in size, and national parks which exceed 6000 acres in size and were in existence as of 8/7/77 are mandatory class I areas and cannot be redesignated (see Appendix 7).

- All class II areas can be redesignated to class I status.

- Certain class II areas (class II "floor areas") cannot be redesignated to class III status (see Appendix 8).*

- A redesignation action cannot cause or contribute to exceedances of the maximum pollutant concentrations allowable under the classification of any other area.**

Section 164 also specifies procedures that are to be followed if a state (or Indian tribe) chooses to pursue an area redesignation. It provides that notice and public hearings must be conducted in areas prior to their redesignation. Further, an analysis must be conducted which addresses the health, environmental, economic, social and energy effects of the proposed redesignation. This analysis must be made available to the public prior to any hearings that are held on a proposed redesignation.

The Act also requires additional consultation procedures if federal lands are being considered for redesignation. Section 164(b)(1)(B) requires that, if a redesignation of an area includes federal lands, the state must provide written notice to the appropriate Federal Land Manager and afford "adequate opportunity" (not to exceed 60 days) for the FLM to confer with the state, and for the FLM to submit written comments and recommendations to the state. This section also requires that the state publish a list of any inconsistencies between the proposed redesignation and the FLM recomendations, with an explanation of the inconsistencies and, if necessary, the reasons for making a redesignation against the recommendation of an FLM.

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* The restrictions on redesignation of these "class II floor areas" are found in Sections 164(a)(1) and 165 (a)(2) of the Act, and basically include NPS areas that are greater than 10,000 acres or that are wilderness areas.

** This provision is particularly relevant to NPS managers because it prohibits a de facto reduction in the level of protection that one unit would receive because of redesignation of another unit. For example, Rainbow Bridge National Monument in Utah is a class II area which conceivably could be redesignated to class III. However, because of the proximity of other NPS units to Rainbow Bridge National Monument, the environmental analyses which would be prepared prior to any redesignation action would have to demonstrate that the proposed action would not result in higher than allowable emission concentrations at two nearby areas, Glen Canyon National Recreation area (a class II floor area) and Canyonlands National Park (a mandatory class I area).

Section 164(d) requires the Federal Land Manager to review all national monuments, primitive areas, and national preserves, and to recommend any appropriate areas for redesignation. The Act requires that areas recommended for redesignation be those areas where air quality related values are an important attribute of the area. A review of the National Park Service units was conducted in 1979, and a final list of areas possessing air quality related values as an important attribute was published by the Department of the Interior in the Federal Register on June 25, 1980 (Appendix 6). These areas may or may not be redesignated solely at the discretion of the state (or by Act of Congress).

There are various ways in which NPS personnel can become involved in the redesignation process, including:

- Working with states which are contemplating redesignation actions and assisting in preparation of relevant sections of the required analysis.

- Working with appropriate state officials to help assure that redesignation procedures provide for adequate consultation with NPS officials as to the effects of the proposal on park air quality and AQRVs.

- Becoming actively involved in public review of redesignation issues at the national, state and local levels, including presenting NPS views in writing, attending meetings, participating in public hearings, and assisting local/state government officials in their assessment of redesignation issues.

Any park level activities regarding potential redesignation of NPS lands should be coordinated with regional and AQD personnel.

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APPENDICES

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Appendix 8 National Park Service Class II Areas Which May Not Be Redesignated as Class III (Class II Floor Areas)

GLOSSARY*

Aersol. A dispersion of microscopic solid or liquid particles in a gaseous medium. Smoke and fog are aersols.

Air quality model. A mathematical representation of the behavior of air pollutants or their effects on air quality related values.

Air quality related value (AQRV). A feature or property of an area that is affected in some way by air pollution. Examples include sensitive flora and fauna or visibility.

Attainment area (Also known as "clean air region" and PSD). A geographic area in which the quality of the air is better than the applicable national ambient air quality standards. PSD requirements apply in attainment areas.

Baseline concentration. The concentration of a pollutant at the time of the first application for a PSD permit in an attainment area.

Best available control technology (BACT). An emission limitation applied to a new or modified major stationary source in an attainment area; determined by the permitting authority on a case-by-case basis taking into account environmental consequences, energy considerations, and economic impacts.

Best available retrofit technology (BART). An emission limitation applied to an existing major stationary source that may reasonably be anticipated to cause or to contribute to impairment of visibility in federal mandatory class I areas.

Class I, II, and III areas. Regions in attainment areas where maintenance of existing good air quality is of high priority. In class I areas, maintaining air quality is regarded as having the highest priority with respect to other values; in class III areas, air quality has lower priority than it does in the other two areas. Initially, all attainment areas except mandatory class I areas were designated class II.

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* Parts of this Glossary were obtained from "On Prevention of Significant Deterioration of Air Quality," Committee on the Prevention of Significant Deterioration of Air Quality (National Academy of Science, 1981), pp.127-129.

Criteria pollutant. A pollutant for which a national ambient air quality standard (NAAQS) has been established, i.e., sulfur dioxide, total suspended particulate mass, hydrocarbons, carbon monoxide, ozone, lead, nitrogen dioxide.

Environmental impact statement (EIS). A written documentation of the environmental impacts of a proposed federal action entailing significant impacts on the human environment, prepared in compliance with Section 102(2)(C) of the National Environmental Policy Act of 1969.

Federal land manager. The Secretary of the department of the federal government under whose jurisdiction a piece of federal land is managed.

Haze. An atmospheric aersol of sufficient concentration to be visibile. The particles are so small that they cannot be seen individually, but are still effective in visual range reduction.

Increments. Maximum allowable increases of air pollution over baseline concentrations of pollutants covered by the PSD provisions in class I, II, and III areas.

Lowest achievable emission rate (LAER). An emission limitation applied by the permitting authority on a case-by-case basis to a new or modified major stationary source in a nonattainment area; the most stringent emission limitation contained in a state implementation plan or achieved in practice for a type of source.

Major source. Any source in an attainment area that emits at least 250 tons of any pollutant regulated under the Clean Air Act or any source from among 28 categories of sources that emits at least 100 tons per year of any regulated pollutant.

Mandatory class I area. An international park, a national wilderness area or national memorial park larger than 5,000 acres, or a national park larger than 6,000 acres. States may not reclassify mandatory class I areas.

Mobile source. A pollutant source which moves from place to place, emitting while in motion (e.g., car, truck, ship, plane, etc.).

National ambient air quality standard (NAAQS). National standards, established under the Clean Air Act by EPA, which prescribe levels of pollution in the outdoor air which may not be exceeded.

Primary NAAQS. Standard set at a level to protect public welfare from damage from air pollution.

Secondary NAAQS. Standard set at a level to protect public welfare from damage from air pollution.

National emission standards for hazardous pollutants. A set of standards limiting emissions (or dictating performance or work procedures) for certain identified pollution emission sources. Hazardous pollutants include asbestos, beryllium, and mercury.

New source performance standards (NSPS). A set of federally-established standards limiting the concentrations of pollutants which may be released into the atmosphere from emission points of new and expanded factories and plants.

Nonattainment area. A region where ambient concentrations of criteria pollutants exceed the levels specified as minimal standards for protecting public health and welfare, i.e., the NAAQS. Nonattainment requirements apply in these areas.

Prevention of significant deterioration (PSD). Program established under the Clean Air Act to regulate allowable future increases in air pollution in clean air regions of the country and for the planning and management of the allocation and use of air resources.

Redesignation process. Process authorized under Section 164 of the Clean Air Act, which provides for reclassification of all or part of an attainment area to receive greater or lesser protection from air pollution degradation. Areas may be redesignated as class I, class II or class III.

Source. In atmospheric chemistry, the place, places, group of sites, or areas where substance is injected into the atmosphere. Can include point sources, fugitive sources and area sources.

State implementation plan. A plan devised by a state and improved by the administrator of the U.S. EPA for implementing and enforcing provisions of the Clean Air Act. Part of each SIP must describe a PSD program.

Stationary source. A pollutant source which is in a fixed location (e.g., smelter, unpaved road, etc.).

Visibility. The greatest distance in a given direction of which it is possible to see and identify with the unaided eye a prominent dark object against the sky at the horizon.

Visual range. The distance at which a large black object just disappears from view.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

JUL 2 1981

Memorandum

To: Director, National Park Service
Director, U.S. Fish and Wildlife Service

From: Assistant Secretary for Fish and Wildlife and Parks

Subject: Clarification of Delegation of Authority - Clean Air Act Responsibilities

This memorandum is to inform you that my office shall exercise the authority granted to the Secretary under the Clean Air Act (*see* attached) as it affects matters within the jurisdiction of the Assistant Secretariat for Fish and Wildlife and Parks pursuant to my general delegation of authority under 209 DM 6.1. Please note in particular that my office shall handle all matters regarding EPA visibility regulations, including integral vistas, with the bureaus providing staff support. The functions of the "Federal official charged with direct responsibility for management of such lands" under Section 165(d)(2) of the Act shall be subject to the general policy guidance of my office in all cases and to my office's specific review in controversial cases.

This memorandum supersedes and revokes any implications to the contrary contained in memoranda on this matter dated December 11, 1980 and January 7, 1981 to each bureau, respectively.

G. Ray Arnett

Attachment

CLEAN AIR ACT RESPONSIBILITIES AFFECTING THE NATIONAL PARK SERVICE AND THE U. S. FISH AND WILDLIFE SERVICE

Section 118. Control of Pollution from Federal Facilities

All Department and agency properties, facilities, and activities are subject to, and must comply with all Federal, State, interstate and local requirements respecting the control and abatement of air pollution in the same manner and to the same extent as any non-governmental entity.

Section 121. Consultation

States must consult with the Federal Land Manager on implementation plans, including provisions in the plans concerning implementation of Part C of the Act pertaining to Prevention of Significant Deterioration.

PART C. PREVENTION OF SIGNIFICANT DETERIORATION OF AIR QUALITY

Sections 160 through 169A set forth responsibilities for the protection of the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value. The following sections specifically affect the Department.

Section 164. Area Redesignation

The Federal Land Manager has the opportunity to confer with the States respecting intended redesignations affecting Federal lands under his/her jurisdiction, and may submit written comments and recommendations within 60 days of notification.

The Department has already completed and submitted to Congress and to the States the findings required by Section 164(d).

Section 165. Pre-construction Requirements

The Federal Land Manager (as well as the Federal official charged with direct responsibility for management of the affected lands) has an affirmative responsibility to protect Air Quality Related Values of class I areas and to consider whether a proposed major emitting facility will have an adverse impact on such values in the pre-construction permitting process.

Section 169A. Visibility Protection for Federal Class I Areas

Section 169A(a)(2) sets forth the Secretary's responsibilities in conjunction with the appropriate Federal Land Manager to identify mandatory class I Federal areas in which he/she determines visibility is an important value.

Pursuant to EPA regulations implementing Section 169A, 45 Fed. Reg. 80,083 (Dec. 2, 1980), the Department proposed to identify "integral vistas" associated with mandatory class I Federal areas. 46 Fed. Reg. 3646 (Jan. 15, 1981). The Department has extended the comment period on this proposal, 46 Fed. Reg. 23,389 (April 24, 1981), and will reconsider the proposal after all comments have been reviewed.

THE STATUTORY BASES OF THE NATIONAL PARK SERVICE'S RESPONSIBILITIES AND AUTHORITIES FOR AIR RESOURCE MANAGEMENT

The National Park Service is responsible for the protection and enhancement of all resources within the National Park System, including those which are related to and/or dependent upon good air quality. As steward of the nation's parklands, the National Park Service (NPS) is responsible for protecting and enhancing visibility, wildlife, vegetation, recreational, cultural and historical resources from air pollution damage.

This air resource management related responsibility is grounded in several acts of Congress. Some of these laws contain fairly general language requiring that park resources be managed and preserved for the maximum enjoyment and benefit of future visitors. Others set forth specific air resource management activities for the NPS. Taken together, these laws create a variety of opportunities for aggressive NPS action to manage the air resource and protect the park resources which are dependent upon good air quality. These statutes include the following:

- The National Park Service Organic Act of 1916 and other laws establishing individual NPS units
- The Wilderness Act of 1964
- The National Environmental Policy Act of 1969
- The Endangered Species Act of 1973
- The Clean Air Act (as amended in 1977)
- The Surface Mining Control and Reclamation Act of 1977

Most fundamentally, the Park Service's statutory responsibilities with respect to air quality arise from the broad mandate which established the Park Service in 1916. The National Park Service Organic Act declares that:

> The National Park Service shall promote and regulate the use of the federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations. (U.S.C. title 16, sec. 1)

Many of the individual acts of Congress (or their legislative histories) which establish parks, monuments or other special areas also make clear the NPS responsibility to protect park resources from air pollution-related damage. For instance, there are numerous references in the laws or in their accompanying histories which indicate Congress' clear intention of protecting all the natural values of these areas for "the benefit and enjoyment of the people", of protecting "the superlative scenic features" of the parks, and of preserving these areas' unique cultural, historic and natural features.

The 1964 Wilderness Act states that wilderness areas

> . . . shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness.
>
> Each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have established as also to preserve its wilderness character.

The National Environmental Policy Act (NEPA) and the Endangered Species Act also establish as federal policy the goal of protecting and preserving for future generations such environmental values and resources as are found in national parks. NEPA was created by Congress to assure that actions by governmental entities would be designed and implemented in ways which are sensitive to environmental needs and to potential environmental consequences. Further, that law provides an explicit mandate to the Park Service and other federal agencies to undertake and promote "efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man." Thus, NEPA provides general authorities both to prevent environmental damage and to mitigate unavoidable impacts; this authority along with the statutory authority discussed above to protect and preserve the natural resources in parklands provides a firm basis for the Service's air resource management activities.

The Endangered Species Act, in similar ways, provides a general directive to all federal agencies to take actions to assure that their activities do not harm, either directly or indirectly, any threatened or endangered species of plant or animal. In carrying out this broad mandate to "seek to conserve endangered species and threatened species," agencies such as the Park Service are authorized to use their authorities to assure that the quality of the natural resources under their jurisdictions are preserved and protected for the furtherance of those species which are dependent on the resources. Thus, this statute provides additional authority to Service personnel to take necessary actions to preserve and enhance the quality of the air, the water, the soil and any other resources in the NPS units to provide for the health of important species of plants and animals entrusted to their protection in these units.

In subsequent legislation, Congress made more explicit both the National Park Service's authority and its duty to protect park resources from air pollution-related damage. In the Clean Air Act Amendments of 1977, Congress spelled out some specific substantive and procedural tools to be used by the NPS in carrying out its air quality-related duties. Specifically, a program was established to prevent any significant deterioration of the air quality in clean air regions of the country. This program, called the Prevention of Significant Deterioration (PSD) program, is set forth in sections 160-169 of the Act, as amended (42 U.S.C. 7470). Among its major stated purposes are:

(1) "to preserve, protect and enhance the air quality in national parks, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic or historic value" and

(2) "to assure that any decision to permit increased air pollution in any area to which this section applies is made only after careful evaluation of all the consequences of such a decision and after adequate procedural opportunities for informed public participation in the decision-making process." 42 U.S.C. 7470 (2) and (5).

Under this PSD program, certain areas of the country were set aside to receive the most stringent degree of air quality protection. These so-called "class I" areas include:

(1) international parks,

(2) national wilderness areas and national memorial parks in excess of 5,000 acres, and

(3) national parks in excess of 6,000

Congress dictated that the Secretary of the Interior (with respect to NPS lands) and the federal official charged with direct responsibility for managing any class I lands has an affirmitive responsibility to protect "air quality related values" of NPS class I areas. Specifically, the federal land manager is to consider, during the air pollution control permitting process which takes place before a major source of pollution (i.e., a facility) is constructed, whether it will have an adverse impact on such values. If it is determined that adverse impacts on air-quality related values are likely to occur within a class I area, then the law requires state and/or federal action, through the air pollution control permitting process under the Clean Air Act, to prevent or minimize such adverse impacts.

The 1977 Amendments themselves did not define the term "air quality related values". The National Park Service has interpreted the term as follows:

> Air Quality related values are all those values possessed by an area except those that are not affected by changes in air quality and include all those assets of an area whose vitality, significance or integrity is dependent in some way upon the air environment. These values include visibility and those scenic, cultural, biological, and recreation resources of an area that are affected by air quality (43 Fed. Reg. 15016).

These then are the values and resources that Congress requires the National Park Service to protect against air pollution-related damage in the cleanest air quality regions of the country.

In addition to class I areas, Congress singled out certain other areas ("class II" areas) for somewhat less stringent protection from air pollution damage. Certain of these class II areas, however, were given special status in that they were disqualified, by law, from being redesignated to the less protective status of class III. These special class II areas include:

(1) an existing area exceeding 10,000 acres which is a national monument, a national primitive area, a national preserve, a national recreation area, a national wild and scenic river, a national wildlife refuge, a national lakeshore or seashore, and

(2) a newly established (since August 7, 1977) national park or wilderness area in excess of 10,000 acres.

Thus, even for these non-class I areas under NPS jurisdiction, Congress clearly intended that special measures be taken to assure their preservation from air pollution damage.

In addition to these PSD provisions, the 1977 Clean Air Act Amendments provide special means for protecting an aspect of air quality--visual air quality--from air pollution damage in class I areas. In section 169A of the Act, Congress declared as a national goal: "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas" [42 U.S.C. 7491(a)(1)]. This visibility protection goal or requirement serves as the basis for a number of NPS activities including: (1) designation of those class I areas in which visibility is an important value; (2)identification of those NPS scenic vistas which look from class I areas outward into non-class I lands but which are considered important to the park area visitor's experience; (3) advising states of those class I areas and important vistas in which the visual air quality has been determined to be "impaired" by man-made sources of pollution; (4) identifying (if possible) the source or sources responsible for any such impairment and (5) reviewing and approving or disapproving any proposed pollution control exemption for any source which otherwise would be required to reduce its existing impairment of visibility in a class I area.

In addition to the above-described Clean Air Act sections which explicitly assign air quality-related responsibilities to the National Park Service, there are other Clean Air Act provisions which create duties and/or opportunities for NPS air resource management activities. These include:

Sections 110 and 121: Requirements for Preparation and Implementation of State (Air Quality) Implementation Plans

States are required to prepare, submit to EPA for approval and carry out a state implementation plan (SIP) which will assure that all substantive

federal register

Monday
July 12, 1982

Part VI

Department of the Interior

Office of the Secretary

Internal Procedures for Determinations c Adverse Impact Under Section 165(d)(2)(C)(ii) and (iii) of the Clean Air Act

DEPARTMENT OF THE INTERIOR

Internal Procedures for Determinations of Adverse Impact Under Section 165(d)(2)(C)(ii) and (iii) of the Clean Air Act

AGENCY: Interior Department.

ACTION: Notice of internal procedures on adverse impact determinations under section 165(d)(2)(C)(ii) and (iii) of the Clean Air Act.

SUMMARY: The Federal Land Management for class I air quality areas under the jurisdiction of the National Park Service and U.S. Fish and Wildlife Service has established internal procedures to govern the processing of adverse impact determinations under section 165(d)(2)(C)(ii) and (iii) of the Clean Air Act. These procedures represent the steps through which the determination must go within the Department, including procedures for reaching a preliminary determination on adverse impact, procedures for obtaining public comment whenever possible, and procedures for reaching a final determination. The Department is publishing these internal procedures for general inforamtion purposes, i.e., to let the public know how the Department will process adverse impact determinations.

FOR FURTHER INFORMATION CONTACT: John P. Christiano, Air Quality Division, National Park Service—AIR, P.O. Box 25287, Denver, CO 80225, telephone number (303) 234–6620.

SUPPLEMENTARY INFORMATION: Part C of the Clean Air Act ("Act"), as amended, entitled the "Prevention of Significant Deterioration of Air Quality," includes requirements for major new facilities which wish to locate in relatively unpolluted areas of the country ("clean air regions"), where the new pollution might affect certain Federal conservation areas ("class I areas"), valued for their pristine air quality or other natural, scenic, recreational, or historic resources sensitive to air pollution. In this situation, the Act imposes special responsibilities on the managers of such class I areas to ensure that no major new facility will have an unacceptable, adverse impact on the areas' protected resources. The "Directive on Procedures" printed below sets forth the internal procedures which the Assistant Secretary for Fish and Wildlife and Parks, who is the Federal Land Manager for areas under the jurisdiction of the National Park Service and U.S. Fish and Wildlife Service, has instructed the bureaus to follow in processing such an adverse impact determination.

Section 165 of the Act governs the permitting of proposed major facilities in clean air regions. 42 U.S.C. 7475. It sets forth several "standards" or "tests" for analyzing a proposed facility's impact on the clean air regions in general, and on the class I areas in particular. These standards or tests include, among others, the National Ambient Air Quality Standards; class I, II, and III air pollution increments; and the adverse impact determination for class I areas, which is the subject of the internal procedures published in this notice. Knowledge of the relationship among these three standards or tests is necessary in order to understand the role of the third one, the adverse impact determination.

In brief, *National Ambient Air Quality Standards*, which must not be exceeded under any circumstances, are standards applicable to the entire country. These standards represent those pollution levels appropriate for protecting the public health and national welfare. Attainment and maintenance of these National Ambient Air Quality Standards constitute one of the fundamental purposes of the Clean Air Act: All areas presently not in compliance with the standards must improve their air quality to meet them, and all areas cleaner than the standards must not deteriorate so as to exceed them.

The two remaining standards or tests—class I, II, and III increments and adverse impact determinations—are the primary tools of section 165 for preventing the significant deterioration of the air quality in the clean air regions of the country. The class I increments apply to clean air regions containing areas such as national parks and wilderness areas. Under the Clean Air Act, Congress designated 158 natural, scenic, or historic areas of special national significance as class I. The class I increments represent the extremely small amount of additional pollution that Congress thought, as a general rule, should be allowed in class I areas. The class I increments also represent the restriction on additional pollution which Congress thought necessary in most cases for protection of the resources in class I areas. Typically, therefore, a proposed facility must not violate the class I increment.

The *"adverse impact" determination*, however, provides the possible exception to the general rule that a proposed facility must not violate the class I increment described above. The adverse impact determination, which is the subject of the internal procedures printed below, is a site specific test which examines whether a proposed facility will, in fact, unacceptably affect the resources of a class I area. If the Federal Land Manager of the class I area determines that a proposed facility will not adversely affect the class I area, then the permitting authority may authorize the facility even though the facility's emissions may cause a violation of the class I increment. (In this situation, the facility must, nevertheless, not exceed a revised set of class I increments established by section 165(d)(2)(C)(iv) of the Act.) Conversely, if the Federal Land Manager determines and convinces the permitting authority that a proposed facility will adversely affect the class I area even though it will not cause a violation of the class I increment, then the permitting authority may not authorize the facility. Thus, the adverse impact test is a critical test for a proposed facility desirous of locating near a class I national park or wilderness area.

The directive published below instructs the bureaus as to the processing of an adverse impact determination. It constitutes a procedural checklist for the bureaus. It also embodies the evolving policy of the Department to include the public in the decisionmaking on the adverse impact determination. In particular, the directive provides for a thirty-day public comment period on the preliminary determination whenever possible within the constraints of statutory and implementation plan deadlines. In this way, the Department seeks to allow full discussion of the issues involved and to ensure the best available information for the final detemination.

The procedures listed in the directive published below are being followed in an ongoing adverse impact determination concerning five major new facilities in North Dakota proposing to locate in the vicinity of Theodore Roosevelt National Park and Lostwood National Wildlife Refuge (wilderness portion), both mandatory class I areas. A notice of the preliminary determination by the Federal Land Manager that these facilities will not adversely affect the class I areas is published elsewhere in today's Federal Register.

Directive on Procedures for Determinations Under Section 165(d)(2)(C)(ii) and (iii) of the Clean Air Act

To: Director, National Park Service.
Director, Fish and Wildlife Service
From: G. Ray Arnett, Assistant Secretary for Fish and Wildlife and Parks

The following procedures apply to determinations under section

165(d)(2)(C)(ii) or (iii) of the Clean Air Act of whether a proposed new source will have an unacceptable, adverse impact on the air quality related values established for a class I area. The steps listed below are to be carried out as expeditiously as possible, without jeopardizing sound decisionmaking, in order to enable the permitting authority (the State or the Environmental Protection Agency (EPA)) to make its decision on the overall PSD permit application within one year of the filing of the completed application as required by section 165(c) of the Act. The following steps are also to be carried out in consultation with EPA as appropriate. Whenever provisions of the permitting authority's implementation plan make execution of the listed steps impossible (*e.g.*, inadequate time allotments for the Federal Land Manager's determination), the procedures shall be adjusted as appropriate, after consultation with the Solicitor's Office.

1. Receipt of PSD permit application.

2. Technical review of application to determine need for additional information.

3. Technical review of impact of proposed new source on air quality related values (including visibility) of class I area.

4. Compliance with other statutory authorities, as applicable, including the following:

a. Initiation of consultation with the U.S. Fish and Wildlife Service if required under Endangered Species Act, 16 U.S.C. 1536.

b. Determination of effect, if appropriate, on properties included or eligible for inclusion in the National Register, and solicitation of comment from the Advisory Council on Historic Preservation if required under National Historic Preservation Act, 16 U.S.C. 470f.

5. Technical review of "adverseness" of impact (if any), and submission of bureau recommendation on "adverse impact" or "no adverse impact" determination.

6. Assistant Secretarial review of bureau recommendation on "adverse impact" or "no adverse impact" determination, and formulation of Assistant Secretarial determination under section 165(d)(2)(C)(ii) or (iii).

7. Notification of preliminary determination by letters to owner/operator of proposed new source, State, and EPA.

Simultaneous with #7, publication of preliminary determination in "Notice" section of Federal Register, including—

a. Statement as to availability of supporting documentation for inspection and copying at NPS Air Quality Division offices in Denver, Colorado, and in Washington, D.C., and at affected park and refuge headquarters; and

b. Announcement of thirty-day public comment period (not to be extended except in the most unusual circumstances) on issues directly relevant to the determination in question.

9. Timely review and brief summarization of relevant comments received within comment period, and responses thereto.

10. Final Assistant Secretarial determination, as soon as possible after end of comment period, of "adverse impact" or "no adverse impact", with a clear and concise statement of reasons supporting that determination.

11. Notification of final determination by letters to owner/operator of proposed new source, State, and EPA. If final determination in a section 165(d)(2)(C)(iii) situation concludes "no adverse impact", Assistant Secretary (in role as "Federal Land Manager") shall so "certify" in letter.

12. Simultaneous with No. 11, publication of final determination in "Notice" section of Federal Register, including—

a. Clear and concise statement of reasons supporting that determination;

b. Statement as to availability of supporting documentation for inspection and copying at NPS Air Quality Division offices in Denver, Colorado and in Washington, D.C.; and

c. Statement as to immediate effective date (as of date signed) of final determination.

Dated: July 7, 1982.

G. Ray Arnett,

Assistant Secretary for Fish and Wildlife and Parks, and Federal Land Manager for Areas Under the Jurisdiction of the National Park Service and the Fish and Wild life Service.

[FR Doc. 18745 Filed 7-9-82; 8:45 am]

BILLING CODE 4310-70-M

AIR QUALITY INTERPRETIVE MATERIALS

The attached materials are examples of text which is used for interpretive pamphlets on air resource management in the parks.

Chaco Culture National Historical Park
Visibility Interpretive Pamphlet

Chaco Culture National Historical Park was established as a unit of the National Park Service in 1907, for its cultural resources (primarily 12 large ruins). The National Park Service also must protect and manage the significant natural resources including air quality and visibility. Chaco Canyon is part of a monitoring system called "Visibility Investigative Experiment in the West" a program designed to determine existing conditions from which future trends can be projected. Chaco needs long term monitoring to detect problems at early stages and, at best, anticipate them before they occur. Certainly, in order to make sound long term land management decisions, the National Park Service must have an understanding of the interaction of the air resource with other resources.

Chaco Culture National Historical Park lies within the energy rich San Juan Basin. One quarter of the nation's known coal reserves and one-sixth of the world's known uranium reserves are located within its geographic boundary. Several coal fired power plants effect the airshed of the Basin, and the area abounds in dirt roads which contribute a considerable amount of airborne dust.

The ruins, rock art, plants and animals, as well as the quality of visitor experience while visiting the Park are susceptible to air quality deterioration. Thus the monitoring systems provides an early warning system concerning pollution problems; it develops a historical record on the condition of the Park's air resources over time; and it provides the basis for National Park Service personnel to make informed and effective air resource management decisions. The National Park Service wants to assure that the quality of visual resources within the Park are maintained for today's visitor and generations to follow.

This means the Park Service must be aware of the scenic resources and how they may be affectd by changing levels of air pollution from sources in and near the Park.

What are some of the visual resources that are important to the interpretation of Chaco Canyon? The Anasazi Indians of Chaco built and maintained over 400 miles of road (up to 30 feet wide) in order to move trade goods and people over a vast area. Along with this road system, the Chacoans developed an extensive visual communications network, tying in all of the outlying communities with those in the Canyon. Many of these outliers are situated so that they can see at least two signaling "shrines" located on the canyon rims. In order to properly discuss these outliers, road, and communication system, it is essential to maintain the clarity of Chaco's vistas. These vistas include (but are not limited to):

1. The San Juan Mountains: 75 miles north
2. The Chuska Mountains: 35 miles west
3. Lobo Mesa and Hosta Butte: 31 miles south
4. Mt. Taylor: 65 miles southwest
5. Nacimento Mountains: 75 miles east
6. The La Plata Mountains: 75 miles northeast

Every day at 9 am and 3 pm there is a Ranger at Pueblo Alto monitoring and interpreting air quality through the use of a "Multi-Wavelength Contrast Teleradiometer." Light reflected from a visitor (Vistas are distant mountains or buttes that are selected for their importance to the Park's interpretive story) forms an image that is progressively degrated as it passes through the atmosphere in a way that is proportional to the amount of pollution in the air. The teleradiometer measures the amount of image forming light remaining at an observation point as well as the amount of light present in the sky. By comparing image light to brightness of the open sky, a measurement of loss of visibility due to particles suspended in the air is recorded. In addition, the instrument is multi-wavelength: it measures not only light in general, but also in specific wavelengths, or colors of light. The instrument detects this, which may aid in identification of particle source. It is known that particles in the 0.1 to 1.0 micron size are the ones that interfere most with visibility. Wind blown sand has a lesser effect.

Another instrument used at Chaco is the Fine Particulate Sampler, or Stack Filter Sampler. This device takes particles out of the air through a vacuum system. The particles are collected on two filters according to size. These samples provide data on kind and size of airborne particulates.

The National Park Service is installing an additional piece of monitoring equipment: an acid rain station. If you are interested in more information, we encourage you to meet the Ranger at Pueblo Alto (one of our backcountry trails requiring a permit), or ask to speak with one of our air quality observers at the Visitor Center.

AIR QUALITY STUDIES AT CAPULIN MOUNTAIN

During your visit to Capulin Mountain National Monument you may see a ranger operating some unfamiliar equipment. We are part of a network of 20 National Park Service areas, mostly in the West but a few in the East, doing a national study of air quality.

It seems self-evident that many human activities are putting little particles into the air. Industrial smokestacks, automobile exhausts, strip mining, coal-fired generating plants, even the dust of a cattle drive all pretty certainly affect air quality. Visibility may be reduced, breathing affected, and recently we have been realizing the dangers of certain particles combining with water to form "acid rain," which can contaminate surface waters and affect life in vast areas. There is no doubt that changes are occurring. But when it comes to making laws to prevent further air damage, or starting expensive clean-up projects, the nation needs hard data, accurate information. It is not enough for an old-timer to say, "Why when I was a boy I could see every tree on that ridge, and now they're just a blur!" Quite likely he's right; but just how much damage is that? And is it constant, or occasional? And just what is the material in the air? That is the kind of information this study is designed to gather. We wish, of course, that we had these data from decades ago. But from now on we will be able to make accurate, measurable comparisons.

The basic instrument for this research is a multiwavelength contrast telephotometer. The "contrast telephotometer" part refers to the fact that this instrument measures the light reflecting off of a target (usually trees 15 miles or so away) and, by comparing that light to the brightness of the open sky, measures any loss of visibility due to material suspended in the air. In addition the instrument is "multiwavelength." It measures not only light in general, but also in specific wavelengths. Air-borne particles of different sizes reflect different wavelengths, or colors, of light. For instance, oxides of nitrogen make the sky shift toward the red-brown, while oxides of sulfur shift it toward a milky color. The instrument detects this, which helps determine just what the pollutants are, which helps us figure out where they are coming from.

Another instrument used here takes direct samples of particles in the air. Vacuum cleaner type motors pull air through different kinds of filter paper. Then the papers are chemically analyzed to determine exactly what was in the air.

This project is beginning to give us accurate information where before we had only estimations. In some places the data confirm what we already suspected. In other cases we are being surprized, sometimes that the facts show that the air quality is better than we hoped – but other times worse than we feared. In either case, this long term research will supply information our nation needs to make intelligent decisions about protecting and developing our resources.

OH SAY CAN YOU SEE ...

AN AIR QUALITY INTERPRETIVE PAMPHLET

NATIONAL PARK SERVICE

OH SAY CAN YOU SEE ...

A National Park ... mountains, lake, or seashore against a clear blue sky, the air fresh and invigorating. Clouds, fog, snow, rain may be acceptable additions - even volcanic ash. But the air is getting dirty, even in parks and wilderness areas far from cities. And views of scenic wonders are not the only things that suffer from pollution. That haze between you and your favorite landmark may also be detrimental to the health of animals (including humans), damage plants, or combine with precipitation to form the acid rain which kills fish and even damages buildings.

National Parks are like miners' canaries, the little birds that use to be taken into mines so that if the bird died, the miners knew the air was bad and it was time to do something. Sensitive natural ecosystems respond quickly to changes in the environment, warning when conditions change for the worse. Concern about air quality in National Parks was focused by the constuction of the Four Corners Power Plant near Farmington, New Mexico in 1963; its plume could be seen for many tens of miles and affected air quality and visibility in several southwestern parks. By the late 1960's and early 1970's smog began to appear in Yosemite Valley. Battles erupted over proposed coal-fired power plants on the Kaiparowits Plateau near Capitol Reef National Park. In the east, Great Smoky Mountains, Acadia, Shenandoah and others became hazy but not from natural haze. Public concern, expressed in magazine and newspaper articles decrying the loss of visual clarity, created political pressure for legislative action. In August 1977, Congress adopted the nation's first visibility requirements for national parks and wilderness areas by amending the Clean Air Act.

Provisions of the National Park Service Organic Act of 1916, laws establishing individual parks, the Wilderness Act of 1964, the National Environmental Policy Act of 1969, and the Endangered Species Act of 1973 had already established National Park Service responsibility for management of air resources. But the 1977 amendments to the Clean Air Act made this management part of a national effort, affecting activities outside, as well as inside, park boundaries.

The National Park Service mandate to manage air as a resource is a particularly important and difficult one. Visitor enjoyment and health, the preservation of cultural resources, and the integrity of natural systems depend upon it; yet it is quite a different sort of undertaking than management of most other park resources. The wind blows where it will, and sometimes park management must deal with pollution sources many miles away, some of which provide the livelihoods for large numbers of people.

To help meet these responsibilities, in 1978 the NPS established the Air and Water Quality Division (AWQD) with a technical staff based in Denver. The major tasks of the AWQD are:

1. Providing support to the NPS and Department of the Interior by preparing materials for use by Congress and by other agencies;

2. Reviewing Environmental Impact Statements;

3. Developing, reviewing, and analyzing policy positions on proposed air quality regulations;

4. Reviewing air quality permit applications for major new and modified industrial facilities whose activities might affect Air Quality Related Values (AQRV's) in parks;

5. Planning, designing, and implementing air quality-related research;

6. Incorporation of air quality concerns and issues into park planning;

7. Synthesis of air quality data from research and monitoring activities for park use in interpretation; and

8. Providing policy and technical information and assistance to parks and regions (at not cost to them).

The chances are that any question that cannot be answered in the field or region will end up at AWQD in Denver, and the people there will either answer it, or figure out who can.

POLLUTANTS: TYPES, SOURCES AND EFFECTS

Particular atmospheric pollutants that concern the NPS include:

- Sulfur Dioxide (SO_2): Sources include volcanoes, fossil fuel power plants, and copper/lead smelters. SO_2 can be extremely corrosive to stone, paint, and metals and damaging to lungs and plants. In the atmosphere it is converted to sulfuric acid and sulfates.

- Nitrogen Oxides (No_x): Key contributor to photochemical smog and nitric acid in acid precipitation. Irritates eyes, nose, and throat, suppresses plant growth, and impairs visibility. Often characterized by a brown cloud or plume. Sources include coal-fired power plants, auto emisions, coal gasification, and manufacturing and processing.

- Photochemical Smog, Hydrocarbons and Ozone: Result of interaction of pollutants in the air, especially nitrogen oxides and hydrocarbons, combining to create photochemical oxidants, especially ozone. Effects include poor visibility, eye irritation, respiratory problems, leaf drop, and damage to paint, textiles, etc. Sources include vehicle emissions, fossil fuel power plants, and various kinds of smelting, refining, manufacturing, and processing.

- Carbon Monoxide (CO): Carbon monoxide is a colorless, odorless, poisonous gas which is extremely toxic to humans at low concentrations. Natural sources of carbon monoxide, such as forest fires and respiration by plants and plankton, make a minor contribution to the atmosphere. Most carbon monoxide is derived from man-made sources as the result of the incomplete combustion of the carbon in fuels in automobiles, trucks and buses. Carbon monoxide is usually a localized pollution problem rather than one caused by emissions transported from sources miles away.

- Particulate Matter: May be a wide range of sizes, with the very fine particles often causing the worst effects; often responsible for poor visibility.

Effects can include cancer, damage to lungs, brain, and central nervous system, and interference with plant metabolism. When the fine particles are sulfates or nitrates, effects can also include acidification of soils, surface and ground waters, with resulting adverse impacts on plants and animals. Sources of SO_2, which ultimately forms into sulfates, include coal-fired power plants, copper smelters and other smelting processes. Particulates are also produced by diesel motors, most kinds of mining, and industrial activities.

- Hydrogen Sulfide (H_2S): A highly toxic and corrosive gas resulting from copper/lead refining, oil and gas wells, smelting, and other processing, with small amounts coming from natural sources such as geysers, volcanoes, and swamps. Can be deadly to animals (including humans) and damaging to plants.

- Hydrogen Fluoride (HF): Result of aluminum production, fertilizer production, coal-fired power plants, coal gasification. Readily accumulates in pasture plants, posing danger to grazing animals.

WHAT WE'RE SEEING

Visibility

Air quality conditions are affected by many factors such as meteorology, topography, and illumination/sun angle. For the contiguous 48 states, under ideal conditions the maximum possible visibility can be approximately 250 km, with a theoretical upper limit of 391 km. The best visibility is found in the Southwest, where it averages 110 km (68 mi) and sometimes reaches 250 km (155 mi). In the Pacific Northwest visibility averages 25 km (16 mi), 72 km (45 mi) in the northern and central plains, and less than 24 km (15 mi) east of the Mississippi and south of the Great Lakes. Studies based on NPS and other longer-term data show that from the mid-1950's to the early 1970's visibility decreased 10% to 40% in rural areas in the Northeast, and 10% to 30% in the Southwest, but through the later 1970's visibility increased 5% to 10%.

Clear air is much more sensitive to pollution than already-polluted air. If the visibility is 120 miles and a tiny amount of sulfate aerosol (only 2 micrograms per cubic meter of air - a microgram is 1 millionth of a gram) is added, visibility goes down to 80 miles. However, if the visibility is only 15 miles to begin with, and the same 2 micrograms of sulfate aerosol is added, the visibility only drops to 14 miles. For 5 miles initial visibility, the same addition only causes a drop to 4.9 miles. Sulfates, which originate primarily from industrial facilities, are the major contributors to visibility degradation in the Southwest, and are also precursors of acid rain.

Trajectories

Where the air mass over your park came from determines what it brings to you... and where it is heading determines who will get that stuff next. In the Southwest, air masses approaching from the west pass over the populated areas of Southern California and are usually slow moving, picking up a sizeable load of concentrated pollutants. Air masses approaching from the southwest or southeast pass over the smelters of southern Arizona and New Mexico, which can contribute significant amounts of sulfates to air over the Colorado Plateau. (During the

9-month smelter strike of 1980 sulfate concentrations decreased between 50% and 90%, and a 16-month strike in 1969-70 showed even greater decreases.) By contrast, air masses coming from the north and northwest are usually associated with clear conditions, as they move quickly and do not have time to pick up large loads of pollutants.

ACID DEPOSITION - WHAT HAVE WE DONE TO THE RAIN?

Usually called "acid rain," this condition can also occur without liquid precipitation, so "acid deposition" is more accurate. Besides being one of the greatest external threats to parks, it is of global concern because the atmosphere can carry pollutants great distances. (As this is written cross-border acid rain is a hot political issue between Canada and the United States.) Complex chemical reactions occur while materials are in the air, producing both wet and dry acidic, highly corrosive compounds. When these fall back to earth they damage stone, wood, and metal; impede the growth of forests and crops, cause disruption of food chains, and even wipe out entire aquatic populations. More discoveries are constantly being made. Obviously, this can profoundly affect both natural and cultural resources in parks.

The National Atmospheric Deposition Program (NADP) was established to monitor this situation. The NPS, with 17 stations, is part of the Interdepartmental Task Force, which participates in the nationwide NADP monitoring network. Like the other air quality monitoring efforts, this network allows a small number of stations at key locations to provide cost-effective coverge for an immense area.

TWO MAGIC WORDS: "PSD" and "INCREMENT"

In the Clean Air Act Amendments of 1977 Congress gave responsibility for protecting air quality, and resources sensitive to changes in air quality, to the Environmental Protection Agency, the states, and federal land managers (FLM's), and created some specific tools for them to use. The Prevention of Significant Deterioration (PSD) program has four major purposes:

- "to preserve, protect, and enhance air quality in national parks, monuments, seashores, and other areas of special national or regional natural, recreational, scenic, or historic value;"

- "to assure that any decision to permit increased air pollution in any area ... is made only after careful evaluation of all the consequences of such a decision and after adequate procedural opportunities for informed public participation in the decision-making process;"

- "to protect public health and welfare from any actual or potential adverse effect(s) ... from air pollution or from exposures of pollutants in other media, which originate as emissions into the ambient air;"

- "to insure that economic development will occur in a manner consistent with the preservation of existing clean air resources."

To do this a classification system was set up, with various areas of the country designated class I, class II, or class III. A class III area allows for the greatest degree of air quality deterioration. However, no such areas exist to date. The amount of additional pollution - "increment" - allowable in any area depends on its classification, with class I allowing the least. The law sets "a national goal of the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas, which impairment results from manmade air pollution." Class I areas include: international parks; national wilderness areas and national memorial parks in excess of 5,000 acres; and national parks in excess of 6,000 acres. (Currently there are 158 federal class I areas, managed by the USFS, USFWS, or the NPS. The NPS has 48 of them.) All other involved areas were designated class II but they can be redesignated, either by states, or in some cases, by Indian tribes. Existing areas exceeding 10,000 acres which are national monuments, primitive areas, preserves, recreation areas, wild and scenic rivers, wildlife refuges, lakeshores, or seashores; or are newly established national parks or wilderness areas in excess of 10,000 acres can only be redesignated as class I. All other areas initially classified as class II (other than class II "floor areas") can be redesignated as either class I or III. Class II "floor areas" which include several National Monuments, can only be redesignated to class I status.

For each land classification under the PSD program the law established maximum allowable increases (increments) over baseline concentrations of certain pollutants (i.e., sulfur dioxide and particulate matter). These increments may not be exceeded in class II or class III areas. Class I area increments may be exceeded by limited amounts if a new major source applicant can prove that, to the satisfaction of the FLM, Air Quality Related Values (AQRV's) in that area will not be affected. Major Emitting Facilities (MEF's) must submit a preconstruction permit application to the EPA, or to the state if it has been delegated the authroity by the EPA. The Federal Land Manager of any area whose AQRV's might be affected is notified of the permit application and has the opportunity to comment. By law, the FLM has an affirmative responsibility to protect AQRV's. No permit shall be issued if the FLM can convince the permitting authorities that one or more AQRV's will be adversely affected, regardless of whether the allowable increments would be violated. Conversely, if the MEF can convince the permitting authority and the FLM that no damage to AQRV's will occur, the source may be allowed to exceed the class I legal limits.

In addition to the increment provisions, facilities must also comply with National Ambient Air Quality Standards. These standards, applicable nationwide, set pollution levels acceptable for protecting the public health and welfare. A proposed facility must not violate them under any circumstances.

MONITORING - HOW DO YOU SEE AIR?

Air quality monitoring is fundamentally important. For years there have been stories of deteriorating air quality - "Why, when I was boy I could see that mountaintop plain as anything!" - and probably most of these recollections are true. But legislation and enforcement cannot be based on anecdotes.

Visibility and fine-particulate monitoring are done with a network of monitoring stations placed at various park units throughout the United States. Data from these stations help to delineate the mobility of air masses over large areas. Analysis of data yields information about air pollution transport into parks with monitoring stations as well as adjacent units that may not have any monitoring instrumentation. The program provides:

- an "early warning system" for pollution problems, which might make it possible to intervene before serious damage occurs;

- baseline data to identify trends and make projections;

- a basis for evaluating actions taken to protect visibility and other AQRV's;

- a way to learn how air quality is affected by various types, quantities, rates, and locations of pollutants;

- a scientific basis for making policy decisions.

One part of the monitoring effort has been Project VIEW (Visibility Investigative Experiment in the West) which, beginning in 1978, has set up 30 stations in the Southwest and Intermountain West to measure visibility over an extended period of time. Types of VIEW monitoring include:

- Visibility Monitoring: The NPS is charged with preserving visual resources within national parks, which requires being aware of the important vistas in NPS areas and how they may be affected by air pollution.

- Criteria Pollutant Monitoring: monitoring the levels of particular pollutants (particulates, sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, and lead) for which national ambient standards have been or are being set. This is to assure that the national standards, especially for class I and class II areas, are not being violated. The NPS achieves this by gathering information on potential effects of emission sources proposed for construction near parks; by determining how factors such as wind patterns, precipitation, etc., may affect pollutant levels in parks; by confirming that park activities requiring permits (i.e., prescribed burns) meet the permit conditions; and by assessing the impact of pollutants on park AQRV's.

- Air Quality Related Values Monitoring: may involve any combination of visual examination, photography, data collection on sensitive or "indicator: species which react to air quality changes before hardier species do, and air, water and soil sampling to establish baseline data and identify how air pollutants are affecting these resources.

OTHER RESEARCH

Perceived Visual Air Quality: research involving visitors' perceptions of visible pollution in parks. Through the use of comparison slides as well as actual views, visitors have been asked their response to overall (regional) haze as well as haze with obvious bands (plumes) and the effect each has on the landscape. These responses do not seem to be significantly affected by factors such as race, socioeconomic status, age, or gender. The study has found that for most observers: a scene under clean air conditions is most vulnerable to added amounts of pollution; any addition of color to a scene makes air quality seem better; the eye is very sensitive to additonal regional haze as well as to even small contrasts between layers of haze; plumes located where they do not obscure scenic features have minimal impact, while the more these features are obscured, the lower the perceived air quality; and dark plumes are more intrusive than light plumes. The study methods allow comparison of perceived air quality at vistas in different parks, or different vistas within the same park.

SO WHAT DOES ALL THIS HAVE TO DO WITH ME?

Field people are the backbone of the air quality effort. Field staffs do the day-to-day monitoring which provides the scientifc basis for air resource management. Park staffs are the first to know about proposed developments which may affect the air quality in the parks. Once a potential air quality issue is identified the park staff should inform the regional office or Air and Water Quality Division. Action can then be taken to prevent or remedy the problem. Park personnel can also ensure that their own activities, and those of the concessionaires, are within the law. The park staff should inform other employees and park visitors that through conservation we can all help to keep the air in our parks clean.

Clear air is a basic necessity of life. Through energetic followup of the responsibilities given us in the Clean Air Act, through the accumulation of baseline data, by the extensive process of assessing PSD permits, in jobs large and small we can and must work to assure that national parks will always be places where the mountains shine against the sky.

federal register

Wednesday
June 25, 1980

Part II

Department of the Interior

Office of the Secretary

National Monuments, Preserves, and Primitive Areas; Review for Class I Redesignation, Recommendation

DEPARTMENT OF THE INTERIOR

National Monuments, Preserves, and Primitive Areas; Review for Class I Redesignation Recommendation

Purpose

The purposes of this notice are: (1) To inform the public of findings made by the Secretary of the Interior that certain national monuments, national preserves, and primitive areas possess air quality related values as important attributes; (2) to describe the procedures utilized in making these findings; and (3) to respond to public comment requested in the Fedral Register on September 7, 1979. (44 FR 52582)

Action

Findings

The Secretary of the Interior has reviewed the 82 national monuments and 2 national preserves in the National Park System and the 11 primitive areas administered by the Bureau of Land Management and has identified 44 of those areas that possess air quality related values as important attributes. Findings for three areas identified in the preliminary report of September 7, 1979 have been changed.

Public comment indicated that Scotts Bluff National Monument in Nebraska does not possess visibility attributes that meet the criteria applied in this review. The Task Force examined the public comments in conjunction with legislative and management information and concluded that the area did not possess air quality related values of sufficient importance to require protection, beyond that now afforded the surrounding region, in order to realize the purpose for which it was set aside.

Similarly, the Chaco Canyon National Monument was initially identified as possessing visibility values which were important attributes of the area. Careful review of the public comments and the legislative and management information indicates that visibility at Chaco Canyon National Monument is not an air quality related value which is an important attribute of the area. Therefore, Chaco Canyon National Monument is recommended for sustained class II status.

The Congaree Swamp National Monument was initially identified as having air quality related values as important attributes on the basis of its diverse forest community. Visibility was not identified as an important air quality related value at Congaree Swamp National Monument. The Task Force recommended, in the supporting analysis to the preliminary report issued in the Federal Register on September 7, 1979, that the Congaree Swamp National Monument be redesignated as a class I air quality area unless it can be determined that the diverse forest community will not be affected by changes in air quality. The State of South Carolina submitted extensive scientific evidence, including area-specific ambient monitoring data and foliar sensitivity thresholds of native species in the monument, which demonstrated no short-term foliar effects to the resources of the monument at class II levels.

The Task Force considered the evidence and concluded that the data accurately depicted the relative foliar sensitivity of species in Congaree to SO^2 and that exposure of these species to class II increments would cause no short-term foliar effects to the resources. Consequently, the Congaree Swamp is not identified as possessing air quality related values as important attributes. It was noted, however, that damage thresholds for long-term low level exposure intervals have not been established for the species in Congaree. Therefore, if new or additional data become available suggesting that forest resources in Congaree Swamp National Monument would be threatened, appropriate action should be taken, including reconsideration of the Department's finding on this national monument.

A list of the 95 study areas which were reviewed and the Secretary's findings appear in the appendix.

These findings are provided to allow the affected States and Indian governing bodies, in their discretion, to consider redesignation proceedings. The States and Indian govening bodies are, at this time, solely responsible for carrying out the redesignation of areas to class I. In weighing the merits of redesignation, the States and Indian governing bodies are to consider the health, environmental, economic, social and energy factors in which they are expert, along with the Secretary's recommendations which are based solely on the Department's consideration of natural resources and other values that could be affected by changes in air quality. The appropriate arena for fully assessing and balancing these factors is in the redesignation hearings. Some of these additional values and concerns, beyond the limited scope of air quality related values, to be considered by the States and Indian governing bodies should they initiate the redesignation process, are shared by the Department. The Department intends to be fully involved during any redesignation hearing and will, contribute, at that time, a full expression of Departmental concerns.

Background

The Clean Air Act, Part C, The Prevention of Significant Deterioration, Section 164(d), directs the Secretary of the Interior to "review all national monuments, primitive areas, and national preserves" and to "recommend any appropriate areas for redesignation as class I where air quality related values are important attributes of the area." The Act requires the Secretary to report his recommendations, with supporting analysis, to the Congress and the affected States and Indian tribes, who are responsible for undertaking any redesgination. The Secretary assigned lead responsibility for the review of air quality related values to the Assistant Secretary for Fish and Wildlife and Parks. The Assistant Secretary established an Air Quality Task Force made up of representatives of the National Park Service, Bureau of Land Management, and the Office of the Solicitor to support the review effort. Notice of the areas under review, a description of the preliminary analysis procedure, and an invitation for public comment first appeared in the Federal Register on April 10, 1978. (43 FR 15014) The notice was sent to each State Clearinghouse, the Virginia Islands Clearinghouse and the Navajo Nation as part of the consultation process. Over 255 comments were received. These comments, in conjunction with the Task Force findings, were utilized by the Task Force in formulating a preliminary list of areas possessing air quality related values as important attributes. Notice of these preliminary findings, a description of the analysis procedure, an invitation for public comment, a request for information from the States on planned industrial development that may be affected by redesignation, a report on consultation with the States, and procedures for further consultation between the States and Indian governing bodies with the Secretary of the Interior appeared in the September 7, 1979 Federal Register. Again, this notice was sent to each State Clearinghouse, the Virgin Islands Clearinghouse, and the Navajo Nation. Over 230 comments were received. The Assistant Secretary for Fish and Wildlife and Parks reestablished the Task Force with representation drawn from the National Park Service, Bureau of Land Management, Bureau of Indian Affairs, Office of the Solicitor, Office of Policy Analysis and Office of Environmental Project Review. Public comments were utilized by the Task Force, in conjunction with Task Force information, to reexamine the earlier findings and prepare final findings which were forwarded to the Secretary along with any comments submitted by the States and Indian governing bodies. The Secretary of the Interior made his final determinations utilizing both the findings of the Task Force and information provided during the comment period. These final determinations are being sent to the affected States and Indian governing bodies, and to Congress. In order to recognize the key role of the States and Indian governing bodies in the redesignation process, all comments submitted by them are being transmitted to Congress unabridged along with the Secretary's findings.

Summary of Analysis Procedure

The original analysis procedure announced in the April 10, 1978 Federal Register involved a five-step process that was to be applied to each area in order to identify those which possess air quality related values as important attributes. After beginning the analysis, the Task Force revised the procedures to recognize more fully the role assigned to the States and Indian governing bodies for balancing all factors essential to the redesignation process. The analytic procedures and the subsequent revisions were outlined in the Federal Register on September 7, 1979.

In preparing the final determination, the Secretary of the Interior instructed the Task Force to conduct its review and reevaluation of national monuments, national preserves, and primitive areas and complete its findings as to those areas in which air quality related values are important attributes of the area.

Three salient points from the Secretary guided the Task Force in its review and reevaluation of the preliminary recommendations put forth for public comment in the Federal Register on September 7, 1979. These three points included:

(1) The Task Force shall reevaluate only those areas which are the object of comment obtained during the public comment period and the object of information pertinent to the air quality related values of an area.

(2) The Task Force's findings shall be based on air quality related values as important attributes of each area for the purpose of allowing the affected States, in their discretion, to consider redesignation proceedings. (In accordance with the requirements of Section 164(b), State held redesignation proceedings provide the appropriate process for the full analysis and evaluation of all the issues involved in a class I redesignation including consideration of health, environmental, economic, social and energy impacts.)

(3) All comments submitted by the States and Indian governing bodies will be forwarded to the Secretary unabridged as an appendix to the final Task Force report.

The direction provided by these points were used by the Task Force in preparation of the final report to the Secretary.

The Task Force, accordingly, relied on only one criterion: The presence or absence of air quality related values as important attributes of the area.

The final report on the Secretary's findings to Congress and the affected States and Indian tribes was prepared to indicate that while air quality related values exist as important attributes, there are other values and concerns to consider during the redesignation process, some of which are shared by this Department. The Department will present these concerns to the States and Indian governing bodies at that time. In submitting the report to Congress, it should be indicated the Department is not seeking legislative action.

In concluding whether or not an area under review possessed air quality related values as important attributes, the Task Force retained the definitions announced in the April 10, 1978 Federal Register. The definitions are:

Air quality related values are all those values possessed by an area except those that are not affected by changes in air quality and include all those assets of an area whose vitality, significance, or integrity is dependent in some way upon the air environment. These values include visibility and those scenic, cultural, biological, and recreational resources of an area that are affected by air quality.

Important attributes of an area are those values or assets that make an area significant as a national monument, preserve, or primitive area. They are the assets that are to be preserved if the area is to achieve the purposes for which it was set aside.

In identifying the resources of an area, the Task Force reviewed information found in the area's enabling legislation and in management and planning documents, mainly the Statement for Management. After the resources of the area were identified, they were evaluated to determine if they possessed air quality related values as defined above.

The next step involved determining if the air quality related values identified are important attributes of the area. This process hinged on the definition of important attributes. Where values determined to be air quality related were expressly identified as part of the legislative purpose for which the area was set aside, the identification process was clear-cut. The Task Force also identified important attributes where it found that, while the value itself was not expressly named as a purpose for the area's establishment, the preservation of that value intertwines closely with the achievement of those purposes which were expressed.

In determining the importance of air quality related values, the Task Force did not undertake an analysis of each area's present air quality or the consequences of preventing further air quality deterioration. An area's size was not used as a controlling criterion for making the determinations. The size criterion of 5,000–6,000 acres used by Congress in its initial designation of class I areas was useful as an initial guide in the review process, but it was abandoned as a determining factor, since an area's size is not necessarily related to the possession of unique resources which could be affected by air quality.

Effects of Redesignation

The Clean Air Act (Section 164(b)) gives the States and, in some cases, the Indian governing bodies the principal role in the redesignation process. In this process the States or Indian governing bodies will, for each area being considered for redesignation to class I, evaluate the health, environmental, economic, social and energy effects of redesignation.

In order to respond to the States' request for information regarding the potential effects of redesignation on growth and development, a technical report was provided to aid the States, as they are responsible for addressing these concerns. The technical analysis of potential effects on industrial growth was an attempt to represent typical effects only. The technical report was not intended for site-specific application, but was intended only to give the redesignating authorities some general planning information for their use. Though not required by the Act, it was included at the States' request, to aid them in performing their analysis of effects of redesignation upon industrial growth and development.

Response to Public Comment

The formal agency record of comments received in response to the notice in the Federal Register dated September 7, 1979 consists of over 230 written comments, including 47 from State and local governments; 83 from businesses and corporations, 15 from associations and organizations, and 85 from individuals.

Comments were received on:

(1) The importance of air quality related values of areas under review,

(2) The appropriateness of class I redesignation of the areas under review,

(3) The consequence that would follow redesignation of an area, and

(4) The procedural method adopted for the review.

As an overall response to comments received, several factors concerning redesignation in general shall be noted.

This review and reevaluation has resulted in findings that certain national monuments, national preserves, and primitive areas possess air quality related values as important attributes. The Secretary of the Interior directed the Task Force to review and reevaluate those areas listed in the September 7, 1979 Federal Register and to identify for him those which have air quality related values as important attributes and are therefore appropriate for the special protection provided by class I status. The Secretary has made his final determinations and is forwarding them to the affected States and Indian governing bodies, and to the Congress.

In its review, the Task Force concentrated on the importance of air quality related values in each area, as required by the Clean Air Act. The review was based on the resource expertise of the Department of the Interior staff and reflects their legislatively mandated responsibility to manage the resources of these areas for the public benefit.

Concerning redesignation in general, the Secretary notes that the States and Indian tribes have the primary redesignation responsibilities. The Clean Air Act gives the States, and in some areas, the Indian tribes, the exclusive authority to redesignate an area. Before redesignating an area, the States and Indian tribes must consider all of the issues that are affected by redesignation. Specifically, Section 164(b) of the Clean Air Act requires that the States or sovereign Indian governing bodies hold public hearings and describe, analyze, and balance the health, environmental, economic, social, and energy effects of the proposed redesignation. Under the Clean Air Act, States and sovereign Indian governing bodies are given the sole responsibility for redesignation and for balancing the economic and environmental factors in the decision-making process for redesignation.

The Importance of Air Quality Related Values

A large proportion of the comments, particularly those from individual citizens and conservation groups, described values in the areas under study that they felt were both "air quality related values" and "important attributes." The values described include a variety of resources, including visibility, flora, fauna, archeological and recreational resources. These comments were considered during the review procedure and, for the most part, are reflected in the Secretary's findings.

Some comments proposed that the air quality related values for each study area should be ranked with all the other important values that the area possesses. They suggested that this hierarchical approach was the appropriate procedure for assessing the significance of the air quality related values in the area. This suggested procedure was not followed by the Air Quality Task Force. Section 164(b) of the Clean Air Act directed the Federal Land Manager to recommend any appropriate area for redesignation in which air quality related values are important attributes to the area. The Task Force was concerned that the air quality related values of the areas meet the criterion of "important attributes" for which protection is required in order to achieve the purposes for which these areas were established. No attempt was made to rank the relative importance of air quailty related values within one area, or those in one area with air quality related values in another area. Such an apples-and-oranges comparison was not practicable or pertinent, nor was it within the requirements of the Clean Air Act. The test utilized by the Task Force determined importance of the values, not a relative ranking of importance.

Other comments suggested that the definition of air quality related values was too vague to allow an accurate assessment of the importance of air quality related values in specific areas. The definition utilized by the Task Force was designed to be inclusive and unqualified. The values affected by changes in air quality range so broadly that a definition which encompasses all these values may lack the specificity that some respondents sought. The Act specifies that visibility is an air quality related value. The Task Force established four additional general categories—fauna, flora, cultural, and water resources—to facilitate a specific description of the air quality related values in each area. For each area, the values affected by changes in air quality were assigned to one of these categories and explicitly described in the supporting analysis. A specific description of each area's air quality related values, sufficient to indicate whether or not class I status should be considered, is included in the supporting analysis, which was sent to the Congress, the States, and affected Indian governing bodies with the preliminary findings. Additional copies are available on request.

The Appropriateness of Redesignation to Class I

A large proportion of the comments suggested that class I redesignation was appropriate for many areas in order to protect air quality related values. Some noted that many study areas resemble national parks or wilderness areas, which Congress designated as mandatory class I. They suggested this similarity made these areas appropriate for redesignation to class I. Other comments described the scarcity, sensitivity, or aesthetic qualities of the air quality related values in the study areas. They suggested that these properties made redesignation of these areas to class I appropriate. These comments generally contributed to the Task Force's determination that an area possessed air quality related values as important attributes and are accordingly reflected in the Secretary's findings.

Some comments suggested that all areas were appropriate for redesignation. The Task Force did not follow this suggestion. Had Congress been satisfied that all study areas were appropriate for class I redesignation, it would not have directed the Federal Land Manager to perform the review. Furthermore, in its review of all areas the Task Force found that some areas do not, in fact, possess air quality related values as "important attributes" and, therefore, cannot meet the criteria for recommendation for redesignation prescribed by Congress.

Other comments suggested that class II designation sufficiently protected areas with air quality related values. They indicated that air quality deterioration up to the levels allowed by class II increments had no demonstrated adverse effects on air quality related values. The Task Force recognized that, in many instances, the effects of air quality deterioration upon air quality related values remain unknown. For the present, the Task Force assumed that for certain critical resources, such as endangered or endemic species and other resources necessary to be preserved to protect significant natural values, findings of air quality related values as important attributes are appropriate. Class I status would give the Federal Land Manager an opportunity to assess the consequences of changes in air quality before any damage could occur. In the final analysis, the Task Force considered these comments only when they were supported with conclusive and verifiable evidence that the critical and representative resources of an area would be adequately protected by the class II designation. The Task Force forwarded this evidence to the Secretary for his consideration in making the final determinations.

Consequences of Redesignation

Many commenters expressed concern that redesignation would adversely affect the economies of the regions surrounding areas redesignated to class I. They asserted that the Task Force's review did not adequately consider these effects. Some suggested that the Task Force perform a cost-benefit analysis to understand the consequences of redesignation.

The Task Force did not attempt to assess the economic consequences, of redesignation in its review since the Clean Air Act states that this analysis is to be done by the States and sovereign Indian tribes. The Task Force restricted the scope of its review in recognition of the significant role assigned to the States and Indian governing bodies in the redesignation process. The Clean Air Act gives the States and Indian governing bodies exclusive responsibility for redesignating an area, and they must fully assess the consequences of redesignation following specific procedural requirements detailed in Section 164(b). This section requires that "public hearings shall be conducted" and "a satisfactory description and analysis of the health, environmental, economic, social, and energy effects of the health, environmental, economic, social, and energy effects of the proposed redesignation shall be prepared and made available for public inspection" prior to any State redesignation. Thus, had the Task Force, in preparing the recommendations, considered an assessment of the consequences of redesignation, they would have assumed a function specifically assigned to the States and Indian governing bodies.

Other comments suggested that, before recommending an area for redesignation, DOI should prepare an economic impact analysis in accordance with Executive Orders 11821, 11949, and OMB Circular A-107. These documents have been superseded by Executive Order 12044 which does not require an impact analysis of actions like the Secretary's findings on air quality related values.

Some comments suggested that the Task Force Report should explicitly state a purpose for preserving the air quality in each area and describe how that purpose would be affected by specific increases in air pollution. The purpose of redesignating an area class I is to protect any resources of any area that possess air quality related values as important attributes. The supporting analysis, in accordance with the Clean Air Act, describes each area's air quality related resources and determines whether they are important attributes of the area. In many instances the effect of specific increases in air pollution on these air quality related values remains unknown; however, the air quality related values themselves are identified as being important. Some general findings exist (see, for instance, "Susceptibility of Woody Plants to Sulfur Oxide and Photochemical Oxidents" by Donald D. Davis and Raymond G. Wilhour, EPA/600/3-76-102; "Effects of Sulfur Oxides in the Atmosphere on Vegetation" by the National Environmental Research Center, Office of Research Land Development, United States Environmental Protection Agency, Research Triangle Park, North Carolina, September 1973; or "Acceptable Limits for Air Pollution Doses and Vegetation Effects: Sulfur Dioxide" by Leon S. Dochinger and Thomas A. Seliga in *Journal of Air Pollution Control Association*, vol. 25, no. 11, November 1975). Redesignating an area to class I provides the Federal Land Manager with the opportunity to fully assess the effects of increased air pollution on specific areas before any damage can occur. Without class I protection, damage can only be identified after it has occurred.

Other comments suggested that recommendations be delayed because the consequences of redesignation cannot be assessed until visibility regulations are established. This suggestion was rejected since the visibility regulations are not necessary to make recommendations. Other comments stated that redesignation be delayed because EPA has yet to promulgate PSD regulations for pollutants other than total suspended particulates and sulfur dioxide. Thus, the full consequences of redesignating an area class I remains unknown. The Task Force recognizes that uncertainties surround redesignation. However, in requiring this review, Congress imposed a one-year time frame. Moreover, the Department analyzed areas specified by Congress and identified those areas that possess air quality related values as important attributes. These findings do not prevent the redesignating authorities from scheduling the redesignation process to take advantage of available, or soon-to-be-available information.

Other comments expressed concern that class I redesignation of an area would unreasonably restrict the allowable uses of the surrounding land. Respondents cited specific activities about which they were concerned. These included agriculture, coal mining, uranium mining, coal gasification and liquifaction, oil leasing, and general manufacturing. Utility companies were particularly concerned that class I redesignation would limit the number of sites available for coal-fired electrical generating plants.

The Task Force appreciates the concerns expressed by these respondents. However, the information they provided was not applied directly to the review procedure. The information did offer good background material for considering the effects redesignation will have on developments outside the study areas and for understanding which area's air quality related values may be threatened by pending developments.

Some of these respondents misinterpreted the consequences of redesignating an area to class I. Some saw this as freezing all developments in the surrounding region. Should the States or Indian governing bodies decide to redesignate, it should be noted that the Prevention of Significant Deterioration Provisions apply only to the specified 28 major stationary sources and to those major stationary sources with the potential to emit more than 250 tons per year. Only new or modified sources are affected. Existing sources and general areawide growth are not included in the permit review requirements. Some interpreted the class I increments as absolute limitations imposed on allowable deterioration of air quality. In order to address such concerns, the Technical Report was prepared for circulation with the supporting information on air quality related values.

The Task Force emphasizes that the primary effect of redesignating Federal lands as class I is to provide the Federal Land Manager with a determinative role in protecting an area's air quality related values from major emitting facilities. The class I increments provide a guideline for assessing these adverse impacts. All new developments which will not cause or contribute to air quality concentrations in excess of the class I increments are permitted unless the Federal Land Manager demonstrates to the permitting authority that those emissions will adversely impact air quality related values of a class I area. Developments whose emissions will cause or contribute to concentrations in excess of the class I increments are not allowed unless the owner or operator of that development can demonstrate that these emissions will not adversely impact air quality related values in the affected class I area. In all instances increases are limited to the class I' increments (nearly equivalent to class II, see table), except in the special instance when an SO_2 variance is granted. Thus, class I redesignation of an area does not freeze all developments in the surrounding region; it only affects those major new developments which adversely affect the area's air quality related values. Nor do the class I increments represent absolute limits on allowable air pollution increases; they provide a threshold which, when exceeded, requires a demonstration of no adverse effects on air quality related values.

Maximum Allowable Increase Per Class

[In micrograms per cubic meter

	Class			
	I	I'	II	III
Particulate matter:				
Annual geometric mean	5	19	19	37
24-hour maximum	10	37	37	75
Sulfur dioxide:				
Annual arithmetic mean	2	20	20	40
24-hour maximum	5	91	91	182
3-hour maximum	25	325	512	700

Procedural Method

A number of comments were addressed at the size cut-off. They suggested that 10,000 not 5,000 acres, was appropriate. Section 164(a) authorizes a State to designate any area (except Indian reservations) as class I. There appears to be no minimum acreage limitation imposed for lands to be redesignated class I. Further, Section 164(d) requires the Federal Land Manager to review all national monuments, primitive areas, and national preserves and makes no mention of minimum size. Accordingly, the Task Force considered the importance of air quality related values for all areas specified by Congress. The Congressionally established precedent of 5,000 or 6,000 acres (used for areas designated mandatory class I) became a rough guideline for assessing the practicality of redesignation, although each area studied was assessed on its own merits without regard to size. The Task Force understands the limitations placed on national monuments, national parks, and primitive areas greater than 10,000 acres as a prohibition against class III designation.

Other comments suggested the Secretary delay his report until baseline data that would indicate the existing air quality in the areas under study could be obtained. Some suggested that we monitor ambient air quality in these areas for at least one year before submitting the report. We agree that documentation of existing air quality in these areas would have been valuable for this review and will be valuable in the future. However, such information is unnecessary for the purposes of the report, as the report focused attention on determining the presence or absence of air quality related values for each area. These values are values that are affected by changes in air quality; they do not represent the air quality itself. Also, class I status sets increments for allowable pollution increases and does not establish fixed ambient air quality standards. Thus baseline data do not appear essential for assessing how these increments would be affected by general development or the operation of major emitting facilities. Finally, we see the States and Indian governing bodies playing the primary role in the redesignation process. Before they redesignate an area, they must thoroughly analyze the effects of redesignation. If they consider that baseline ambient air quality data are needed to adequately weigh the costs and benefits of redesignation, such data can be obtained at that time, and the timetable for redesignation can be expanded to allow such study.

A few comments noted that some models used for assessing the impacts of pollution sources are subject to errors which exceed the size of class I increments. They suggested that these inaccuracies made redesignation recommendations unworkable. The Task Force recognizes that models used for simulating the effects of air pollution emissions are only accurate within a certain range. However, the Task Force notes that Congress has established the magnitude of the class I increments with an understanding of limitations of the models (see also Alabama v. Costle, No. 78–1006 (D.C. Cir. Dec. 14, 1979)). More importantly, infallible models are not needed to determine whether an area possesses air quality related values as important attributes.

Additional Information

Additional information on these Clean Air Act Section 164(d) findings, or copies of the supporting analysis and technical support document, are available by writing Mr. Alan Feldbaum, National Park Service, Division of Air Quality, Interior Building, 18th and "C" Streets NW, Washington, D.C. 20240, or by contacting him at (202) 343–4911.

Approved: April 30, 1980.

Cecil D. Andrus,
Secretary of the Interior.

Appendix.—*Areas Possessing Air Quality Related Values as Important Attributes*

Area name	State or territory	Gross acreage	Federal wilderness acres already designated class I
Glacier Bay NM.	AK	2,805,769.49	—
Katmai NM	AK	2,792,150.74	—
Canyon de Chelly NM.	AZ	83,840.00	—
Chiricahua NM	AZ	10,648.25	9,440
Organ Pipe Cactus NM.	AZ	330,688.86	312,600
Saguaro NM	AZ	83,576.07	71,400
Sunset Crater NM.	AZ	3,040.00	—
Wupatki NM	AZ	35,253.24	—
Channel Islands NM.	CA	18,388.07	—
Death Valley NM.	CA, NV	2,067,795.06	—
Joshua Tree NM.	CA	559,959.79	429,690
Lava Beds NM.	CA	46,821.33	28,460
Muir Woods NM.	CA	553.55	—
Pinnacles NM	CA	16,215.67	12,952
Black Canyon of the Gunnison NM.	CO	13,672.13	11,180
Colorado NM	CO	20,444.67	—
Dinosaur NM	CO, UT	211,053.45	—
Great Sand Dunes NM.	CO	36,826.50	33,450
Big Cypress N. Pres.	FL	570,000.00	—
Biscayne NM	FL	103,701.23	
Fort Jefferson NM.	FL	47,125.00	—
Craters of the Moon NM.	IO	53,545.05	43,243
Bandelier NM	NM	36,971.20	23,267
Capulin Mountain NM.	NM	775.38	—
El Morro NM	NM	1,278.72	—
Gila Cliff Dwellings NM.	NM	533.13	—
White Sands NM.	NM	145,334.76	—
John Day Fossil Beds NM.	OR	14,402.00	—
Badlands NM	SD	242,302.33	64,250
Cedar Breaks NM.	UT	6,154.60	—
Natural Bridges NM.	UT	7,779.14	—
Buck Island Reef NM.	VI	880.00	—
Devil's Tower NM.	WY	1,346.91	—
Fossil Butte NM.	WY	8,178.00	—
Paiute Primitive Area.	AZ	35,092.00	—
Paria Canyon Prim. Area.	AZ, UT	27,515.00	—
Chemise Mountain Prim. Area.	CA	3,941.00	—
Powder Horn Prim. Area.	CO	40,400.00	—
Beartrap Canyon Prim. Area.	MT	2,861.00	—

Appendix.—*Areas Possessing Air Quality Related Values as Important Attributes*—Continued

Area name	State or territory	Gross acreage	Federal wilderness acres already designated class I
Centennial Primitive Area.	MT	24,166.00	
Humbug Spires Prim. Area.	MT	7,041.00	
Dark Canyon Prim. Area.	UT	57,248.00	
Grand Gulch Prim. Area.	UT	24,080.00	
Scab Creek Prim. Area.	WY	6,680.00	

Appendix.—*Study Areas Recommended for Continued Status as Class II Areas*

Area name	State or territory	Gross acreage
Russell Cave NM	AL	310.45
Casa Grande NM	AZ	472.50
Hohokam Pima NM	AZ	1,555.40
Montezuma Castle NM	AZ	841.75
Navajo NM	AZ	360.00
Pipe Spring NM	AZ	40.00
Tonto NM	AZ	1,120.00
Tumacacori NM	AZ	10.15
Tuzigoot NM	AZ	57.78
Walnut Canyon NM	AZ	2,249.46
Cabrillo NM	CA	143.94
Devil's Postpile NM	CA	798.43
Florissant Fossil Beds NM	CO	5,992.32
Hovenweep NM	CO, UT	785.43
Yucca House NM	CO	10.00
Castillo de San Marcos NM	FL	20.49
Fort Matanzas NM	FL	298.51
Fort Frederica NM	GA	214.52
Fort Pulaski NM	GA	5,815.50
Ocmulgee NM	GA	683.48
Effigy Mounds NM	IA	1,474.63
Saint Croix Island NM	ME	35.39
Fort McHenry NM and Historic Shrine.	MD	43.26
Grand Portage NM	MN	709.97
Pipestone NM	MN	281.78
George Washington Carver NM.	MO	210.00
Custer Battlefield NM	MT	765.34
Agate Fossil Beds NM	NE	3,054.43
Homestead NM of America	NE	194.57
Scotts Bluff NM	NE	2,987.97
Lehman Caves NM	NV	640.00
Aztec Ruins NM	NM	27.14
Chaco Canyon NM	NM	21,510.32
Fort Union NM	NM	720.60
Gran Quivira NM	NM	610.94
Pecos NM	NM	364.80
Castle Clinton NM	NY	1.00
Fort Stanwix NM	NY	15.52
Statue of Liberty NM	NY, NJ	58.38
Mound City Group NM	OH	87.50
Oregon Caves NM	OR	465.80
Congaree Swamp NM	SC	15,135.00
Fort Sumter NM	SC	62.27
Jewel Cave NM	SD	1,274.56
Alibates Flint Quarries and Texas Panhandle Pueblo Culture NM.	TX	92.56
Big Thicket N. Pres.	TX	84,550.00
Rainbow Bridge NM	UT	160.00
Timpanogos Cave NM	UT	250.00
Booker T. Washington NM	VA	223.92
George Washington Birthplace NM.	VA	455.98
Aravaipa Canyon Prim. Area	AZ	5,107.00

[FR Doc. 80-15283 Filed 5-27-80; 8:45 am]

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NATIONAL PARK SERVICE AREAS DESIGNATED AS CLASS I

Acadia NP, Maine
Arches NP, Utah
Badlands NP, South Dakota (wilderness portion)
Bandelier NM, New Mexico (wilderness portion)
Big Bend NP, Texas
Black Canyon of the Gunnison NM, Colorado (wilderness portion)
Bryce Canyon NP, Utah
Canyonlands NP, Utah
Capitol Reef NP, Utah
Carlsbad Caverns NP, New Mexico
Chiricahua NM, Arizona (wilderness portion)
Crater Lake NP, Oregon
Craters of the Moon NM, Idaho (wilderness portion)
Denali NP and Preserves, Alaska
Everglades NP, Florida
Glacier NP, Montana
Grand Canyon NP, Arizona
Grand Teton NP, Wyoming
Great Sand Dunes NM, Colorado (wilderness portion)
Great Smoky Mountains NP, North Carolina, Tennessee
Guadalupe Mountains NP, Texas
Haleakala NP, Hawaii
Hawaii Volcanoes NP, Hawaii
Isle Royale NP, Michigan
Joshua Tree NM, California (wilderness portion)
Kings Canyon NP, California
Lassen Volcanic NP, California
Lava Beds NM, California (wilderness portion)
Mammoth Cave NP, Kentucky
Mesa Verde NP, Colorado
Mount Rainier NP, Washington
North Cascades NP, Washington
Olympic NP, Washington
Petrified Forest NP, Arizona
Pinnacles NM, California (wilderness portion)
Point Reyes NS, California (wilderness portion)
Redwood NP, California
Rocky Mountain NP, Colorado
Saguaro NM, Arizona (wilderness portion)
Sequoia NP, California
Shenandoah NP, Virginia
Theodore Roosevelt NP, North Dakota
Virgin Islands NP, Virgin Islands
Voyageurs NP, Minnesota
Wind Cave NP, South Dakota
Yellowstone NP, Wyoming
Yosemite NP, California
Zion NP, Utah

NATIONAL PARK SERVICE CLASS II AREAS WHICH MAY NOT BE REDESIGNATED AS CLASS III (CLASS II FLOOR AREAS)

Amistad NRA, Texas
Aniakchak NM and Pres., Alaska
Apostle Islands NL, Wisconsin
Assateague Island NS, Virginia
Bering Land Bridge N Pres., Alaska
Big Cypress N Pres., Florida
Bighorn Canyon NRA, Montana, Wyoming
Big South Fork NR and RA, Kentucky, Tennessee
Big Thicket N Pres., Texas
Biscayne NP, Florida
Canaveral NS, Florida
Canyon de Chelly NM, Arizona
Cape Cod NS, Massachusetts
Cape Hatteras NS, North Carolina
Cape Krusenstern NM, Alaska
Cape Lookout NS, North Carolina
Channel Islands NP, California
Colorado NM, Colorado
Congaree Swamp NM, South Carolina
Coulee Dam NRA, Washington
Cumberland Island NS, Georgia
Curecanti NRA, Colorado
Cuyahoga Valley NRA, Ohio
Death Valley NM, California, Nevada
Delaware Water Gap NRA and NSR, New Jersey, New York, Pennsylvania
Denali NP and NPreserve, Alaska
Dinosaur NM, Colorado, Utah
Fire Island NS, New York
Gates of the Arctic NP and Pres., Alaska
Gateway NRA, New York and New Jersey
Glacier Bay NP and Pres., Alaska
Glen Canyon NRA, Arizona, Utah
Golden Gate NRA, California
Gulf Islands NS, Florida, Mississippi
Indiana Dunes NL, Indiana
John Day Fossil Beds NM, Oregon
Katmai NP and Pres., Alaska
Kenai Fjords NP, Alaska
Kobuk Valley NP, Alaska
Lake Chelan NRA, Washington
Lake Clark NP and Pres., Alaska
Lake Mead NRA, Arizona, Nevada
Lake Meredith NRA, Texas
Noatak N Pres., Alaska
Organ Pipe Cactus NM, Arizona
Padre Island NS, Texas

Pictured Rocks NL, Michigan
Ross Lake NRA, Washington
Sleeping Bear Dunes NL, Michigan
Whiskeytown NRA, California
White Sands NM, New Mexico
Wrangell-St. Elias NP and Pres., Alaska
Wupatki NM, Arizona
Yukon Charley N Pres., Alaska

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